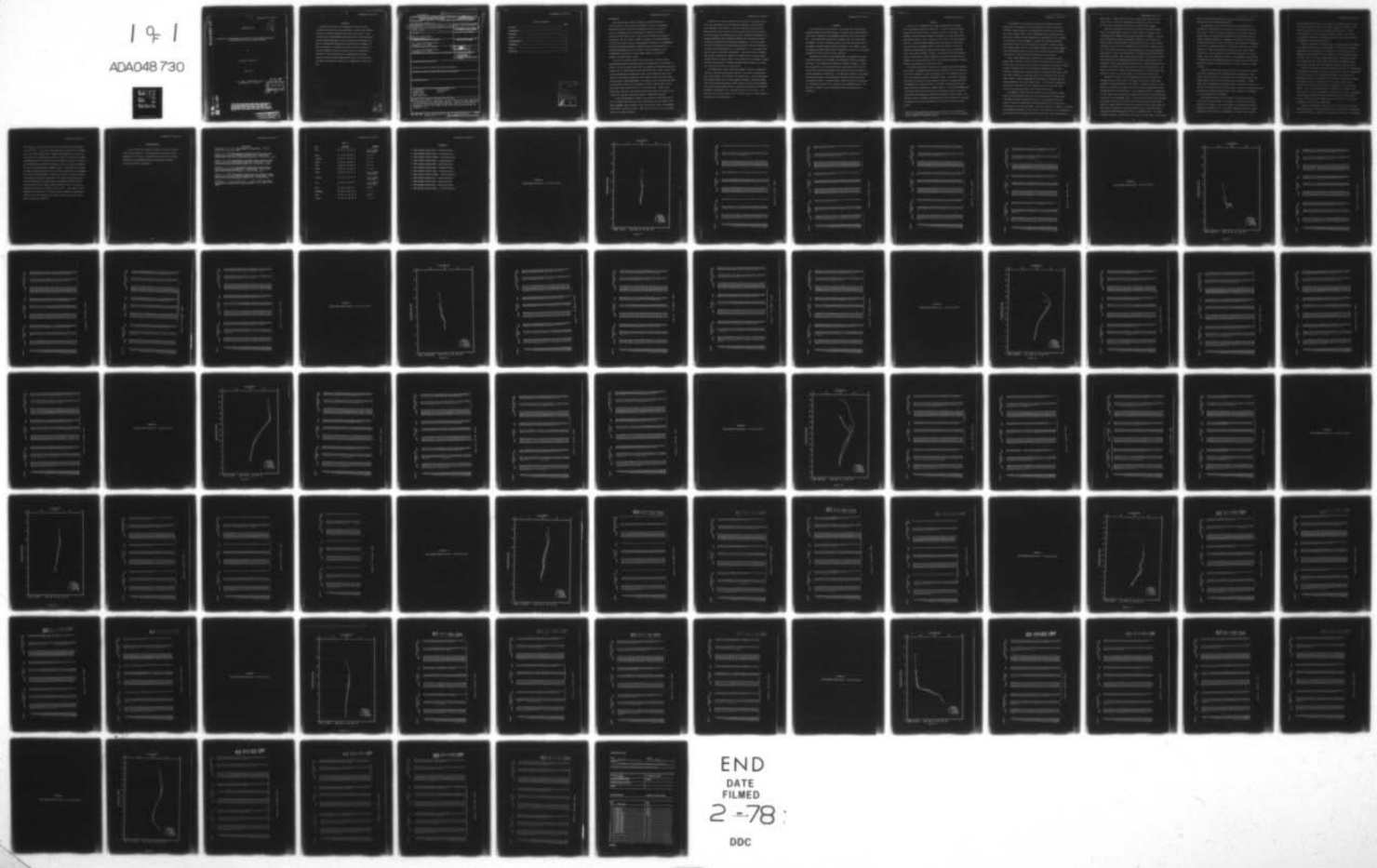
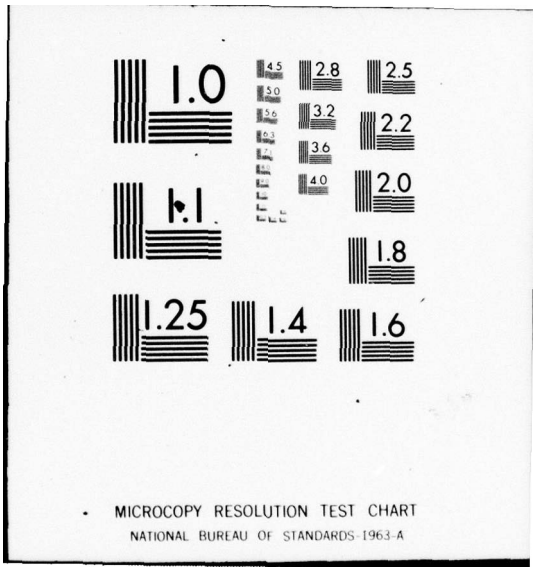
AD-A048 730 NAVAL OCEANOGRAPHIC OFFICE WASHINGTON D C F/G 8/11
VARIABILITY OF OCEANOGRAPHIC CONDITIONS AT OCEAN WEATHER STATIO--ETC(U)
JUN 77 W H BEATTY
UNCLASSIFIED N00-TN-3700-67-77 NL

1 of 1
ADA048 730



END
DATE FILMED
2-78
DDC


1.0
1.1
1.25
1.4
1.6
1.8
2.0
2.2
2.5
2.8
3.2
3.6
4.0
4.5
5.0
5.6
6.3
MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

NAVOCEANO TN 3700-67-77

TECHNICAL NOTE

VARIABILITY OF OCEANOGRAPHIC CONDITIONS AT OCEAN WEATHER STATIONS IN THE NORTH ATLANTIC AND NORTH PACIFIC OCEANS

by

William H. Beatty III

June 1977

U. S. NAVAL OCEANOGRAPHIC OFFICE
WASHINGTON, D. C. 20373

ABSTRACT

Seasonal mean salinity and temperature values and their variability from the mean were determined for twelve ocean weather stations in the North Atlantic and North Pacific Oceans. High variabilities in near-surface layers above 200 m can be explained by wind-induced mechanical mixing and upwelling and temporal variations in radiational heating and cooling from the atmosphere as well as advection. At depths below 200 m the close proximity of strong or moderate fronts and internal waves are reasonable explanations of high variabilities in temperature and salinity. Tabular listings and mean temperature-salinity (T-S) diagrams for each OWS are presented by season in the appendices following the text.

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

(14) NOO-TN-3700-67-77

REPORT DOCUMENTATION PAGE

READ INSTRUCTIONS BEFORE COMPLETING FORM

1. REPORT NUMBER: Technical Note 3700-67-77 ✓	2. GOVT ACCESSION NO.
3. RECIPIENT'S CATALOG NUMBER	
4. TITLE (and Subtitle): (6) Variability of Oceanographic Conditions at Ocean Weather Stations in the North Atlantic and North Pacific Oceans.	5. TYPE OF REPORT & PERIOD COVERED: (9) Technical note,
	6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s): (10) William H. Beatty, III	8. CONTRACT OR GRANT NUMBER(s)
9. PERFORMING ORGANIZATION NAME AND ADDRESS: U.S. Naval Oceanographic Office ✓ Washington, D.C. 20373	10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
11. CONTROLLING OFFICE NAME AND ADDRESS: U.S. Naval Oceanographic Office Washington, D.C. 20373	(11) 12. REPORT DATE: Jun[redacted]77
	13. NUMBER OF PAGES: 86
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office)	15. SECURITY CLASS. (of this report): (12) 89p. UNCLASSIFIED
	15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of this Report)

Approved for public release; distribution unlimited

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Oceanography
Atlantic Ocean
Pacific Ocean
Water Temperature
Sound Velocity
Salinity

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

Seasonal mean salinity, temperature, and sound velocity and their variability were determined for 12 ocean weather stations. Variability above 200m depths is caused by wind-induced mixing and upwelling, advection and radiational heating and cooling. Below 200m internal waves and ocean fronts cause the variability.

DD FORM 1 JAN 73 1473 EDITION OF 1 NOV 65 IS OBSOLETE S/N 0102-014-6601 | 25 0 450 UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

Table Of Contents

INTRODUCTION

The ocean weather stations occupied for extended periods of time by vessels of various nations equipped for routine oceanographic observations provide the naval environmentalist with an excellent source of information about oceanographic variability at certain locations in the world's ocean. Because the observations are usually time-series, that is, taken at regular intervals over extended periods of time, their value as aids to oceanographic forecasting is considerable. The data from these observations compiled during the construction of a Northern Hemisphere data file, provide a brief introduction to the oceanographic conditions at ocean weather stations in the North Atlantic and North Pacific Oceans.

The use of stationary ships in the open ocean to acquire routine meteorological data was initiated nearly two decades prior to World War II. However, it was not until August 1956 that Canadian oceanographers initiated Nansen casts at Ocean Weather Station (OWS) PAPA (50°N, 145°W). Before then routine oceanographic measurements taken at ocean weather stations were limited to sea surface temperatures and thermal profiles taken with shipboard mechanical bathythermographs. The Nansen casts at OWS PAPA were taken to both shallow (400 m) and intermediate (2000 m) depths weekly, and, at least three times during a cruise, to near the bottom. (Husby, 1967) Temperature, salinity, and dissolved oxygen observations were made at each station with silicate observations made at intermediate stations.

In 1962 oceanography was added to the statutory responsibilities of the U. S. Coast Guard with the result that Nansen casts were begun at OWS BRAVO, CHARLIE, DELTA, and ECHO in the North Atlantic and at OWS NOVEMBER and VICTOR in the North Pacific. Names and locations of the ocean weather stations are shown in Table I.

Observations at these stations have been taken intermittently since 1964 with approximately the same methods, instruments, and procedures being employed at each station. The basic program consisted of daily Nansen casts to 1500 m plus two casts to near the bottom on each cruise. Sea water samples were analyzed at sea with an induction salinometer, and in situ temperatures and thermometric depths were determined with pairs of protected and unprotected reversing thermometers. Sea water samples from both the surface and deepest bottles from each cast were forwarded to the Coast Guard Oceanographic Unit in Washington, D. C., and analyzed for quality control of salinity measurements. Coast Guard vessels occupying ocean weather stations were required to remain within a ten-mile square centered about the station insofar as the exigencies of navigation, weather, and mission would permit. Similar procedures were followed at six additional stations maintained by other nations.

The observations taken at the Ocean Weather Stations are especially useful to long-term climatological studies of sea surface temperatures, sonic layer depths, sound channels, and surface ducts. When incorporated into acoustic models such as Fast Asymptotic Coherent Transmission Model (FACT) and Shipboard Helicopter Acoustic Range Prediction System (SHARPS), these data are particularly useful in determining variability of acoustic parameters (propagation loss, convergence zones) at given points. As such the data are particularly useful to naval planners in their planning and execution of ASW operations.

PROCEDURE

Ocean station data consisting of both Nansen casts and salinity-temperature-depth (STD) drops from each of twelve ocean weather stations (OWS) were accessed from the NAVOCEANO UNIVAC-1108 ocean station data file. Only those casts extending to a depth of 200 m or greater were considered. The data, grouped by season, were collected from within a two-degree rectangle centered about each station. For example, in the investigation of OWS VICTOR (34°00'N, 164°00'E) all data in the rectangle bounded by 33°-35°N, 163°-165°E were examined.

Seasonal mean salinities and temperatures at standard depths were tabulated together with the number of observations and their standard deviations. All observations occurring in January, February, or March were considered to be winter observations, and those occurring in the second, third, and fourth quarters were deemed to be spring, summer, or autumn observations, respectively. The data were treated in this manner because meteorological and oceanographic heating and cooling lag the astronomical seasons. The mean seasonal observations were also plotted on a temperature-salinity (T-S) diagram using a XYNETICS plotter. No attempts were made to adjust questionable data through deletion or smoothing.

RESULTS

Results of the computations are shown in Appendices A through L with each appendix covering a single OWS*. OWS INDIA, located between Iceland and the British Isles, is totally lacking in winter data. OWS NOVEMBER, situated between California and Hawaii, was excluded from the study because data from that station were not found in the ocean station data file. OWS ALFA, BRAVO, CHARLIE, KILO, and INDIA all located away from the strong and moderate fronts of the North Atlantic, show less variation of temperature and salinity from surface to bottom than OWS DELTA, ECHO, HOTEL, JULIETT, and MIKE. Low evaporation and high precipitation in these high latitudes together with strong wind mixing and the absence of a strong or moderate front cause relatively homogeneous oceanographic conditions both in space and in time.

The water at OWS ALFA, located in the Irminger Sea between Greenland and Iceland, is probably formed by mixing of fairly saline (35.35°/00) and warm (9.5°C) Northeast Atlantic Water and cold (4.0°C) moderately saline (34.9°/00) Irminger Sea Water (Fairbridge, 1966). Convective overturning and strong wind mixing in winter combine to maintain standard deviations of temperature of less than 0.50°C. The higher temperatures during the summer months are indicative of surface heating. The increased temperatures in the upper 200 m with little or no salinity change repress convective overturning thus eliminating surface ducts during the warmer months. The combined effects of autumnal overturning and winter cooling act to suppress the formation of a sonic layer depth at this station during the colder months.

*All data in the appendices and text are in metric units with depths in meters, temperatures in degrees Celsius, salinities in parts per thousand, and sound speeds in meters per second.

At OWS BRAVO in the Labrador Sea between Greenland and Labrador temperatures in the upper 100 m are consistently colder than those at OWS ALFA. General features of the thermohaline structure at OWS BRAVO are given by Shuhy (1969). These temperatures show a pronounced annual march with a maximum surface temperature of approximately 9.5°C occurring in late August or early September. Although the maximum temperature gradient was found to be in the upper 100 m, effects of summer warming were found as deep as 450 m. The combined effects of sea surface temperature maximum and surface salinity minimum (34.28°/00) during the summer months tend to inhibit convective overturning at this station.

Shuhy (1969) suggests that the presence of a permanent halocline between 200 m and 400 m acts as a barrier to convective overturning for the better part of the year in spite of winter cooling and wind mixing. However, studies of oxygen content of the bottom and deep waters found in this vicinity are indicative of strong convective overturning (Fairbridge, 1966). High static stability in the upper layers at this station leads to high warmer oceanic surface temperatures and destruction of surface ducts for sound propagation in the warm summer months. The increase of temperature with depth at this station can be explained by cold, relatively fresh arctic water overriding warmer, more saline oceanic water.

OWS CHARLIE, located near the southern end of the Reykjanes Ridge, shows a pronounced annual march of sea surface temperature together with a permanent halocline between 200 and 400 m. The permanent halocline tends to inhibit the temperature variability below 200 m and convective overturning at and below this depth. The high salinities (34.92°/00 - 34.98°/00) and temperatures between 3.0° and 3.8°C at and below 1000 m are characteristic of the North Atlantic Deep Water found over the entire North American Basin

Husby (1968). Between 200 m and 1000 m a typical North Atlantic intermediate water is found with temperatures ranging from a 3.5°C to 6.0°C and salinities ranging from 34.90°/00 to 34.93°/00 (Husby, ibid).

Because of OWS DELTA's location near the edge of the North Atlantic Drift, the oceanographic conditions at this station are expected to be considerably more complex than those at ALFA, BRAVO, or CHARLIE. The best way to describe the complex oceanographic conditions in this area is in terms of their standard deviations from their mean values. High standard deviations of up to 2.0°C for temperature and 0.50°/00 for salinity at the 400 or 500 m-level indicate the close proximity of a cold, relatively fresh water mass to a warm, saline water mass. The boundary between these water masses forms a frontal zone containing the easterly - flowing North Atlantic Drift which forms the eastward extension of the Gulf Stream system. The occurrence of such large standard deviations over a comparatively small geographical area shows shifts in the position of this system with time. The frontal zone with its downward slope of isotherms to the south caused sharp horizontal as well as vertical changes in the sound velocity profile.

OWS ECHO's location near the northeastern limit of the Sargasso Sea explains the warm, saline water in the upper 200 m and the strong, deep (200-800 m) thermocline found at this station. Seasonal variation of temperature is confined to the upper 200 or 300 m with the maximum layer depth occurring during the winter months. High standard deviations of temperature at this station may be explained by periodic meanderings of Gulf Stream water through this area (Rosebrook, 1971). The two principal water masses observed in the upper 1500 m at this station are the North Atlantic Central Water present at depths from 200 to 800 m and a mixture of Mediterranean Water and North Atlantic Deep Water called Upper North Atlantic Deep Water found at intermediate depths between 800 and 1500 m (Rosebrook, 1971). The large standard deviations of temperatures well below the mixed layer at this station

may be caused by vertical motion of the main thermocline induced by intermal waves or wind-driven upwelling.

The extremely large variations of salinity and temperature at OWS HOTEL are explained by its location near the northern edge of the Gulf Stream. Strong wind mixing, especially in the colder winter and spring months, and large-scale meanders of the Gulf Stream combine to produce standard deviations in temperature as high as 5.7°C and those in salinity as high as 1.1°/00. During the winter months the temperature at 400 m has a standard deviation of 4.20°C and a mean value of 9.31°C. Because this depth is well below the mixed layer, the high standard deviation is a strong indication of horizontal meandering of the Gulf Stream. Such large temporal variations in oceanographic conditions over a comparatively small geographical area are important to naval planners because they lead to strong horizontal and vertical gradients of sound velocity.

OWS INDIA, located about 250 miles south of Iceland, shows somewhat more saline, warmer water than OWS ALFA located further west. This warmer, more saline water is associated with the northern branch of the North Atlantic Current which continues across the Wyville Thomson Ridge into the Norwegian Sea (Sverdrup, 1942). Some of this water also turns to the north and west and flows south of Iceland in a westerly direction. The mean sound velocity minimum found at 100 m indicates the formation of a sound channel near this depth.

OWS JULIETT and KILO are both located in the eastward extension of the North Atlantic Current. The former is located in the northern branch of this current, and is characterized by standard deviations of temperature exceeding 1.0°C. Such large standard deviations at depths ranging from 400 to 1000 m are indicative of a frontal zone forming a

dynamic boundary between cold, fresh water to the north and warm, saline North Atlantic Central water to the south. OWS KILO is located in the southern and eastern branch of the North Atlantic Current, a region notably lacking in distinct currents (Sverdrup, 1942). This lack of oceanographic variability is reflected in fairly low standard deviations of temperature and salinity below 100 m.

OWS MIKE, located in the Norwegian Sea, is characterized by anomalously warm, saline water for such a high latitude. Salinities and subsurface temperatures in the Norwegian Sea range from 35.3°/00 and 8°C north of Scotland to 35.0°/00 and 4°C to the northwest of the Spitsbergen Islands (Sverdrup, 1942). The large standard deviations of temperature of over 1°C at depths from 100 to 500 m may be the result of traveling eddies flanking the left-hand side of the Norwegian Current (Sverdrup, 1942).

OWS PAPA, located in the Aleutian (Subarctic) Current, is characterized by salinities in the upper 100 m well under 33.0°/00. The cool temperatures and low salinities at this location are probably the result of high precipitation and cooling combined with the effects of mixing of Kuroshio and Oyashio water in the western Pacific (Sverdrup, 1942) and are characteristic of the Subarctic Water so prominent in the northeastern Pacific. The low standard deviation of temperature and salinity below 200 m attest to the low oceanographic variability in this area. The shallow limiting depths between 2000 and 2500 m together with a bottom depth in excess of 4000 m during the summer months at this station indicate good convergence zones for sound propagation.

The data at OWS VICTOR, located near the southeastern limit of the Kuroshio Extension, reflect the generally lower temperatures and salinities of the North Pacific as compared to the North Atlantic Ocean. The maximum

mean salinity is less than 34.75 °/00, and the maximum mean temperature is only 24.91 °C. On the other hand, OWS HOTEL, located near the northern edge of the Gulf Stream, shows a maximum mean temperature at 26.14 °C at the surface and a maximum mean salinity 34.90 °/00 at 100 m during summer. Standard deviations of temperature at OWS VICTOR are slightly in excess of 2.0 °C between 200 m and 400 m and are most likely the result of meanders of this well-defined western boundary current. Such meanders are likely to produce strong horizontal as well as vertical sound velocity gradients. The salinity minimum between 34.05°/00 and 34.07°/00 is located at 600 m at the bottom of the main thermocline. This water represents the most northern extension of the North Pacific Intermediate water that flows north along the coast of Japan before reversing as part of the gyre on the right hand side of the Kuroshio (Husby, 1967). This influx of cold, comparatively fresh water at 600 m may produce temporary sound velocity minima at this depth forming sound channels above the mean deep sound channel located at about 900 m.

ACKNOWLEDGMENTS

I wish to thank Dr. Richard W. James, Mr. George L. Hanssen, and Mr. Alvan Fisher, Jr., for their patient assistance in the preparation of the text. Illustrations were done by Mr. Charles Boling using the XYNETICS plotter, and Miss Dayle Nicholson provided secretarial assistance.

REFERENCES

Fairbridge, R. W. (1966) Encyclopedia of Oceanography. Reinhold Publishing Corporation, 1021p.

Husby, D. M. (1967) Oceanographic Observations North Pacific Ocean Station Victor, 34°00'N, 164°00'N, December 1964 - August 1966. United States Coast Guard Oceanographic Report No. 15, CG 373-15, 141p.

Husby, D. M. (1968) Oceanographic Observations North Atlantic Ocean Station Charlie, 52°45'N, 35°30'W, May 1966 - March 1967. United States Coast Guard Oceanographic Report, No. 17, CG-373-17, 148p.

Rosebrook, A. D. (1971) Oceanographic Observations North Atlantic Ocean Station Echo, November 1967 - December 1968. United States Coast Guard Oceanographic Report No. 49, CG 373-49, 343p.

Shuhy, J. L. (1969) Oceanographic Observations North Atlantic Ocean Station Bravo, 56°30'N, 51°00'W, October 1966 - October 1967. United States Coast Guard Oceanographic Report No. 20, CG 373-20, 163p.

Sverdrup, H. U., M. W. Johnson and R. H. Fleming (1942) The Oceans, their Physics, Chemistry, and General Biology. Prentice-Hall, Inc. 1087p.

TABLE I

OWS	POSITION	NATION
ALFA	62° 00' N, 33° 00' W	U. K., France, Netherlands
BRAVO	56° 30' N, 51° 00' W	U. S. A.
CHARLIE	52° 45' N, 35° 30' W	U. S. A.
DELTA	44° 00' N, 41° 00' W	U. S. A.
ECHO	35° 00' N, 48° 00' W	U. S. A.
HOTEL	38° 00' N, 71° 00' W	U. S. A.
INDIA	60° 00' N, 19° 30' W	U. K., France, Netherlands
JULIETT	53° 18' N, 19° 18' W	U. K., France, Netherlands
KILO	45° 00' N, 16° 00' W	U. K., France, Netherlands
MIKE	66° 00' N, 02° 00' E	Norway
NOVEMBER	30° 00' N, 140° 00' W	U. S. A.
PAPA	50° 00' N, 145° 00' W	Canada
VICTOR	34° 00' N, 164° 00' E	U. S. A.

APPENDICES

A OCEAN WEATHER STATION ALFA - (62°00'N,33°00'W)

B OCEAN WEATHER STATION BRAVO - (56°30'N,51°00'W)

C OCEAN WEATHER STATION CHARLIE - (52°45'N,35°30'W)

D OCEAN WEATHER STATION DELTA - (44°00'N,41°00'W)

E OCEAN WEATHER STATION ECHO - (35°00'N,48°00'W)

F OCEAN WEATHER STATION HOTEL - (38°00'N,71°00'W)

G OCEAN WEATHER STATION INDIA - (60°00'N,19°30'W)

H OCEAN WEATHER STATION JULIETT - (53°18'N,19°18'W)

I OCEAN WEATHER STATION KILO - (45°00'N,16°00'W)

J OCEAN WEATHER STATION MIKE - (66°00'N,02°00'E)

K OCEAN WEATHER STATION PAPA - (50°00'N,145°00'W)

L. OCEAN WEATHER STATION VICTOR - (34°00'N,164°00'E)

APPENDIX A

OCEAN WEATHER STATION ALFA - (62°00'N,33°00'W)

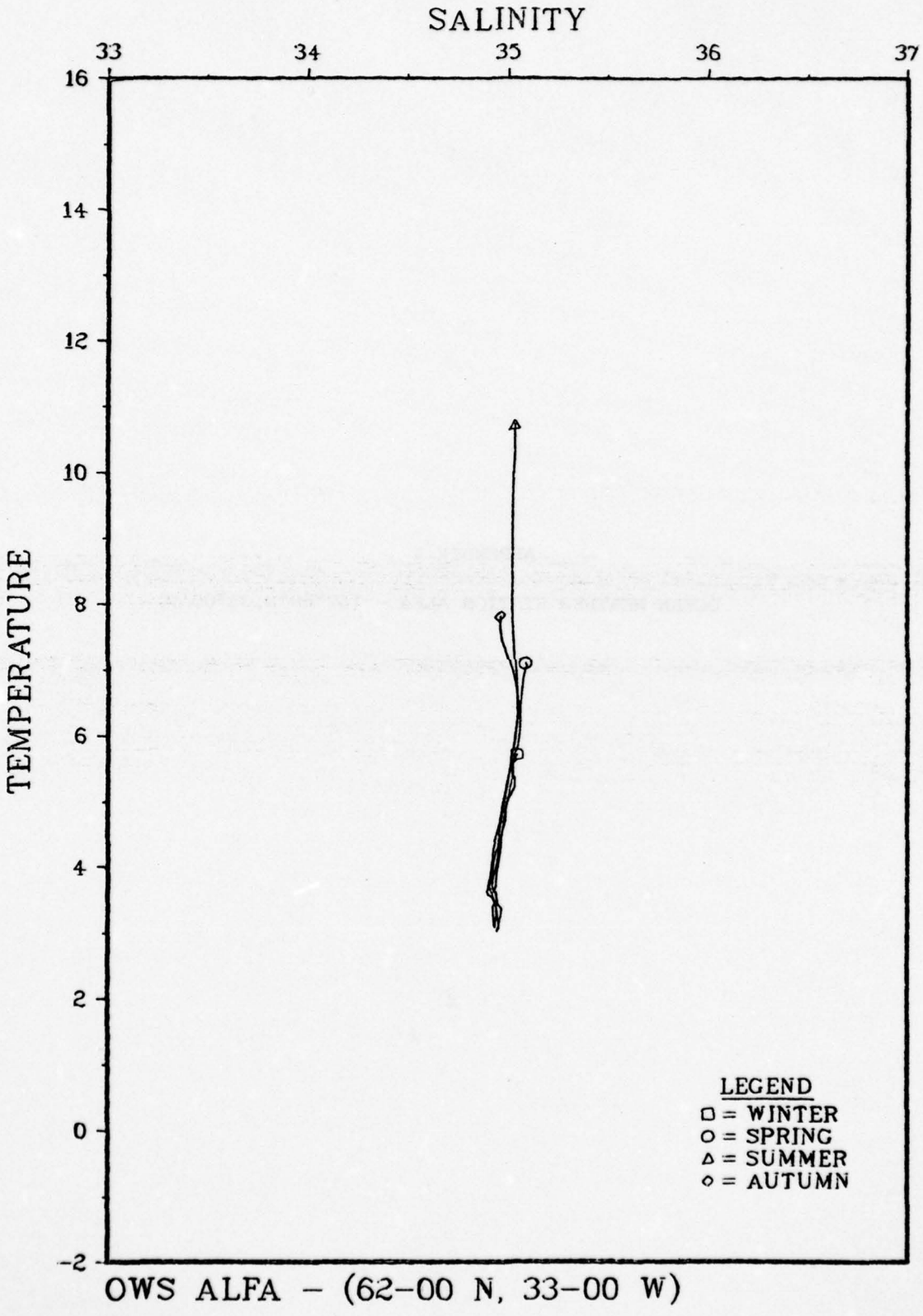

SALINITY
33
34
35
36
37
TEMPERATURE
16
14
12
10
8
6
4
2
0
-2
LEGEND
□ = WINTER
○ = SPRING
△ = SUMMER
◇ = AUTUMN
OWS ALFA – (62–00 N, 33–00 W)

Figure A-1

DEPTH	TEMPERATURE			SALINITY			SOUND VELOCITY		
	MEAN	S.D.	NUM	MEAN	S.D.	NUM	MEAN	S.D.	NUM
0	5.72	.43	8	35.04	.06	8	1474.0	1.8	8
10	5.67	.36	8	35.03	.03	8	1473.9	1.5	8
20	5.65	.35	8	35.03	.05	8	1474.0	1.4	8
30	5.62	.34	8	35.04	.04	8	1474.1	1.4	8
50	5.57	.32	8	35.02	.03	8	1474.1	1.3	8
75	5.54	.32	8	35.02	.02	8	1474.4	1.3	8
100	5.41	.34	8	35.02	.02	8	1474.4	1.3	8
125	5.38	.40	6	35.02	.02	8	1474.6	1.6	6
150	5.36	.41	6	35.03	.02	8	1474.9	1.7	6
200	5.22	.44	6	35.03	.02	7	1475.3	1.9	5
250	5.05	.54	6	35.00	.03	7	1475.5	2.4	5
300	4.96	.56	6	34.99	.03	7	1476.0	2.4	5
400	4.71	.50	7	34.98	.03	7	1476.3	2.2	7
500	4.50	.59	7	34.97	.03	6	1477.4	2.5	6
600	4.25	.40	7	34.96	.02	5	1478.4	1.6	5
700	3.92	.31	8	34.94	.05	6	1478.3	1.4	6
800	3.72	.22	8	34.94	.05	6	1479.0	1.0	6
900	3.66	.15	8	34.93	.04	6	1480.3	.7	6
1000	3.62	.10	8	34.92	.02	7	1481.7	.5	7
1100	3.63	.08	7	34.92	.01	6	1483.4	.4	6
1200	3.61	.09	7	34.94	.01	7	1485.0	.4	7
1300	3.57	.09	7	34.94	.01	7	1486.5	.5	7
1400	3.54	.09	7	34.94	.01	7	1488.1	.4	7
1500	3.51	.10	7	34.94	.01	7	1489.7	.5	7
1750	3.43	.06	8	34.95	.01	8	1493.6	.3	8
2000	3.36	.04	6	34.97	.02	6	1497.6	.4	6
2500	3.01	.00	3	34.94	.01	3	1504.5	.2	3

Figure A-2. OWS ALFA - Winter

DEPTH	TEMPERATURE			SALINITY			SOUND VELOCITY		
	MEAN	S.D.	NUM	MEAN	S.D.	NUM	MEAN	S.D.	NUM
0	7.11	1.05	12	35.08	.04	12	1479.5	4.1	12
10	7.05	1.03	12	35.09	.05	12	1479.5	4.0	12
20	7.02	.97	12	35.08	.04	12	1479.5	3.7	12
30	6.87	.86	12	35.07	.03	12	1479.0	3.4	12
50	6.49	.69	12	35.06	.04	12	1477.9	2.8	12
75	6.24	.58	12	35.06	.05	12	1477.3	2.4	12
100	5.95	.62	12	35.05	.05	12	1476.5	2.5	12
125	5.82	.60	12	35.04	.05	12	1476.5	2.5	12
150	5.73	.60	12	35.03	.05	12	1476.5	2.5	12
200	5.53	.58	12	35.02	.04	12	1476.5	2.4	12
250	5.36	.57	12	35.02	.04	12	1476.6	2.4	12
300	5.24	.56	12	35.01	.04	10	1477.3	2.4	10
400	4.95	.40	11	34.99	.02	9	1477.5	1.8	9
500	4.71	.36	11	34.99	.03	9	1478.3	1.6	9
600	4.46	.35	9	34.96	.02	7	1479.2	1.2	7
700	4.23	.32	9	34.95	.02	7	1479.9	1.0	7
800	4.04	.31	7	34.94	.02	5	1481.0	.7	5
900	3.86	.21	7	34.92	.02	5	1481.5	.6	5
1000	3.73	.16	6	34.92	.01	4	1482.5	.5	4
1100	3.68	.12	6	34.92	.02	4	1483.9	.4	4
1200	3.64	.10	6	34.93	.02	6	1485.1	.4	6
1300	3.62	.10	6	34.94	.02	6	1486.8	.5	6
1400	3.60	.12	6	34.94	.02	6	1488.4	.5	6
1500	3.56	.11	6	34.94	.03	6	1489.9	.5	6
1750	3.48	.09	6	34.95	.02	6	1493.8	.5	6
2000	3.42	.02	2	34.92	.02	2	1497.7	.0	2
2500	3.10	.03	2	34.93	.02	2	1504.9	.2	2

Figure A-3. OWS ALFA - Spring

DEPTH	TEMPERATURE			SALINITY			SOUND VELOCITY		
	MEAN	S.D.	NUM	MEAN	S.D.	NUM	MEAN	S.D.	NUM
0	10.75	1.15	73	35.03	.08	73	1493.0	4.2	73
10	10.35	.96	73	35.03	.07	73	1491.8	3.5	73
20	9.96	.89	73	35.02	.07	73	1490.5	3.3	73
30	9.39	.80	73	35.02	.06	73	1488.6	3.0	73
50	8.07	1.04	73	35.02	.06	73	1484.0	4.0	73
75	7.37	.89	72	35.03	.06	73	1481.7	3.5	72
100	6.92	.72	72	35.04	.06	73	1480.4	2.9	72
125	6.59	.68	72	35.04	.06	73	1479.5	2.8	72
150	6.30	.69	72	35.04	.06	73	1478.8	2.9	72
200	6.06	.70	71	35.03	.05	73	1478.6	2.9	71
250	5.84	.72	71	35.02	.05	73	1478.5	3.0	71
300	5.63	.72	72	35.01	.05	73	1478.5	3.0	72
400	5.22	.67	40	34.99	.05	40	1478.4	2.8	40
500	4.85	.57	39	34.97	.04	39	1478.6	2.4	39
600	4.46	.43	72	34.95	.04	72	1478.6	1.8	72
700	4.19	.34	71	34.93	.04	70	1479.1	1.5	70
800	3.98	.26	71	34.92	.03	70	1479.9	1.3	70
900	3.81	.18	70	34.91	.03	69	1480.8	.9	69
1000	3.69	.13	68	34.90	.03	67	1482.0	.8	67
1100	3.66	.14	34	34.91	.02	34	1483.5	.7	34
1200	3.62	.14	34	34.91	.02	34	1485.0	.8	34
1300	3.60	.13	33	34.92	.02	34	1486.7	.7	33
1400	3.59	.12	33	34.92	.02	34	1488.3	.7	33
1500	3.56	.13	34	34.92	.03	36	1489.8	.7	34
1750	3.49	.10	32	34.93	.03	34	1493.8	.5	32
2000	3.40	.11	29	34.94	.03	29	1497.7	.6	29
2500	3.06	.12	9	34.95	.01	8	1504.7	.5	8

Figure A-4. OWS ALFA - Summer

DEPTH	TEMPERATURE			SALINITY			SOUND VELOCITY		
	MEAN	S.D.	NUM	MEAN	S.D.	NUM	MEAN	S.D.	NUM
0	7.83	1.32	29	34.96	.06	29	1482.1	5.0	29
10	7.80	1.24	29	34.96	.06	29	1482.2	4.7	29
20	7.76	1.18	29	34.96	.05	29	1482.2	4.5	29
30	7.68	1.09	29	34.96	.05	29	1482.1	4.2	29
50	7.50	.89	29	34.97	.06	29	1481.7	3.5	29
75	7.20	.62	29	35.00	.05	29	1481.0	2.5	29
100	7.00	.45	29	35.02	.04	29	1480.7	1.9	29
125	6.81	.40	29	35.03	.04	29	1480.4	1.6	29
150	6.65	.41	29	35.04	.04	29	1480.2	1.7	29
200	6.41	.50	29	35.05	.05	29	1480.1	2.1	29
250	6.16	.56	29	35.04	.05	29	1479.8	2.3	29
300	5.91	.63	29	35.03	.06	29	1479.7	2.6	29
400	5.30	.55	12	34.99	.05	12	1478.7	2.2	12
500	4.78	.40	12	34.96	.04	12	1478.3	1.7	12
600	4.40	.31	28	34.93	.03	28	1478.3	1.4	27
700	4.11	.21	27	34.92	.02	27	1478.7	.9	26
800	3.90	.16	27	34.91	.02	27	1479.5	.7	26
900	3.76	.13	27	34.90	.01	27	1480.6	.6	26
1000	3.67	.11	28	34.90	.04	28	1481.9	.6	28
1100	3.62	.07	12	34.89	.01	12	1483.3	.3	12
1200	3.59	.06	12	34.90	.01	12	1484.9	.4	12
1300	3.57	.04	12	34.90	.01	12	1486.5	.4	12
1400	3.56	.05	12	34.91	.01	12	1488.2	.3	12
1500	3.55	.06	12	34.92	.01	12	1489.8	.4	12
1750	3.49	.04	11	34.93	.01	11	1493.8	.3	11
2000	3.41	.02	6	34.94	.01	6	1497.7	.3	6
2500	3.07	.00	1	34.93	.00	1	1504.8	.0	1

Figure A-5. OWS ALFA - Autumn

APPENDIX B

OCEAN WEATHER STATION BRAVO - (56°30'N,51°00'W)

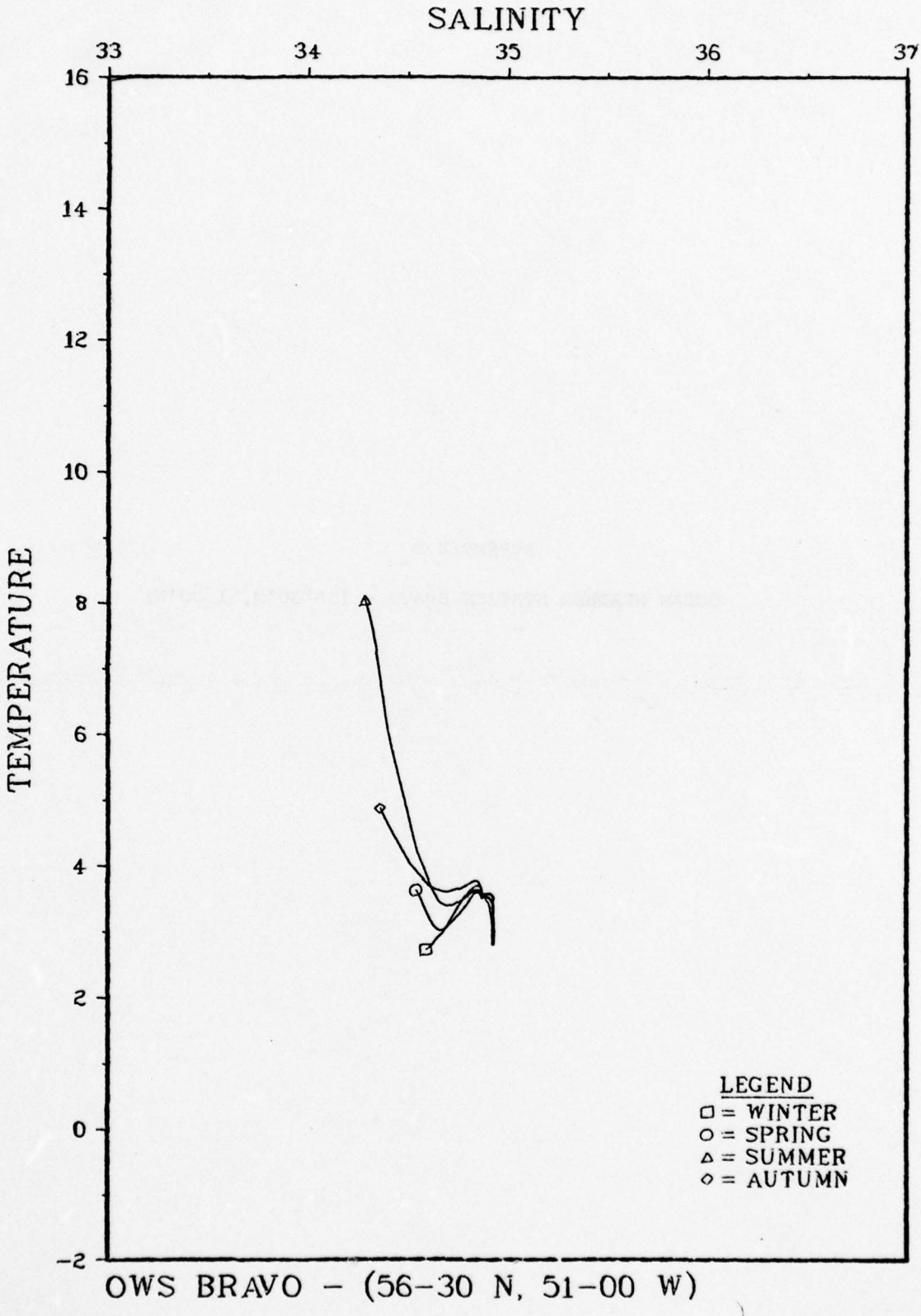

SALINITY
33
34
35
36
37
16
14
12
10
8
6
4
2
0
-2
TEMPERATURE
LEGEND
□ = WINTER
○ = SPRING
△ = SUMMER
◇ = AUTUMN
OWS BRAVO - (56-30 N, 51-00 W)

Figure B-1.

DEPTH	TEMPERATURE			SALINITY			SOUND VELOCITY		
	MEAN	S.D.	NUM	MEAN	S.D.	NUM	MEAN	S.D.	NUM
0	2.72	.65	332	34.59	.16	342	1460.8	3.1	332
10	2.72	.65	332	34.59	.16	342	1461.0	3.1	332
20	2.72	.65	332	34.59	.16	342	1461.1	3.1	332
30	2.73	.64	342	34.59	.16	342	1461.4	3.1	342
50	2.74	.64	342	34.59	.16	342	1461.7	3.1	342
75	2.75	.65	342	34.60	.15	341	1462.2	3.1	341
100	2.78	.65	342	34.61	.15	341	1462.7	3.2	341
125	2.86	.66	342	34.63	.14	341	1463.5	3.1	341
150	2.98	.66	342	34.67	.13	341	1464.5	3.1	341
200	3.39	.51	342	34.75	.09	340	1467.2	2.5	340
250	3.64	.41	341	34.81	.06	339	1469.2	2.0	338
300	3.71	.39	341	34.84	.06	336	1470.4	2.0	335
400	3.72	.34	329	34.86	.05	323	1472.1	1.7	320
500	3.69	.28	328	34.87	.04	323	1473.6	1.5	320
600	3.66	.26	332	34.87	.04	327	1475.2	1.4	325
700	3.63	.23	328	34.87	.04	324	1476.7	1.4	321
800	3.59	.22	319	34.87	.04	315	1478.2	1.4	312
900	3.56	.19	301	34.88	.04	297	1479.7	1.6	293
1000	3.53	.18	235	34.88	.04	232	1481.3	1.2	229
1100	3.50	.16	161	34.88	.03	162	1482.8	.9	159
1200	3.50	.15	148	34.88	.03	148	1484.5	.9	146
1300	3.52	.16	148	34.89	.04	148	1486.3	1.0	146
1400	3.55	.16	150	34.89	.04	150	1488.1	.9	148
1500	3.54	.15	141	34.90	.04	140	1489.7	1.0	138
1750	3.52	.11	60	34.91	.03	60	1493.9	.8	60
2000	3.46	.08	55	34.92	.02	55	1497.9	.6	55
2500	3.18	.05	46	34.93	.02	46	1505.3	.6	46
3000	2.77	.12	31	34.93	.01	31	1512.2	.7	31

Figure B-2. OWS BRAVO - Winter

DEPTH	TEMPERATURE			SALINITY			SOUND VELOCITY		
	MEAN	S.D.	NUM	MEAN	S.D.	NUM	MEAN	S.D.	NUM
0	3.63	1.03	729	34.54	.19	730	1464.6	4.6	729
10	3.57	.99	730	34.55	.18	729	1464.6	4.4	729
20	3.51	.93	730	34.56	.18	729	1464.5	4.2	729
30	3.43	.86	730	34.57	.17	729	1464.3	3.9	729
50	3.24	.70	730	34.60	.15	728	1463.9	3.3	728
75	3.08	.54	730	34.63	.14	728	1463.6	2.8	728
100	3.00	.48	730	34.66	.14	727	1463.8	2.6	727
125	3.02	.47	730	34.68	.13	727	1464.3	2.5	727
150	3.06	.45	730	34.70	.12	726	1464.9	2.5	726
200	3.29	.37	729	34.76	.09	725	1466.8	2.0	724
250	3.51	.36	729	34.81	.07	725	1468.6	2.0	724
300	3.60	.37	729	34.83	.06	725	1469.9	2.2	724
400	3.62	.37	717	34.85	.06	714	1471.6	2.1	711
500	3.59	.33	714	34.86	.06	710	1473.2	2.0	707
600	3.56	.30	716	34.86	.06	712	1474.7	1.9	709
700	3.54	.27	714	34.87	.06	710	1476.3	1.6	707
800	3.52	.24	708	34.87	.05	698	1477.9	1.8	696
900	3.50	.21	686	34.87	.05	675	1479.4	2.1	673
1000	3.48	.20	592	34.87	.05	589	1481.0	1.9	588
1100	3.48	.19	481	34.87	.04	480	1482.7	1.6	480
1200	3.49	.18	464	34.88	.05	462	1484.4	1.6	462
1300	3.51	.18	463	34.88	.05	460	1486.2	1.6	460
1400	3.53	.17	462	34.89	.05	459	1488.0	1.5	459
1500	3.54	.16	460	34.90	.05	456	1489.7	1.6	456
1750	3.51	.15	84	34.91	.03	84	1493.9	.9	84
2000	3.46	.13	78	34.93	.03	78	1497.9	.8	78
2500	3.19	.11	78	34.93	.02	78	1505.3	.7	78
3000	2.80	.10	75	34.93	.02	75	1512.3	.6	75

Figure B-3. OWS BRAVO - Spring

DEPTH	TEMPERATURE			SALINITY			SOUND VELOCITY		
	MEAN	S.D.	NUM	MEAN	S.D.	NUM	MEAN	S.D.	NUM
0	8.05	1.20	711	34.28	.25	711	1482.1	4.9	711
10	7.72	1.23	711	34.31	.23	692	1481.0	5.0	692
20	7.25	1.35	711	34.34	.23	692	1479.6	5.3	692
30	6.20	1.37	711	34.39	.21	692	1475.7	5.5	692
50	4.27	.83	709	34.54	.15	692	1468.2	3.7	690
75	3.66	.50	709	34.62	.12	692	1466.1	2.6	690
100	3.44	.41	709	34.66	.12	690	1465.6	2.3	688
125	3.38	.38	709	34.70	.11	690	1465.8	2.1	688
150	3.39	.35	709	34.73	.10	690	1466.3	2.0	688
200	3.49	.27	709	34.78	.08	689	1467.7	1.7	687
250	3.60	.22	709	34.82	.07	687	1469.0	1.7	685
300	3.64	.22	709	34.84	.06	686	1470.0	1.8	684
400	3.64	.24	697	34.85	.05	671	1471.7	1.9	670
500	3.62	.24	694	34.86	.05	662	1473.3	1.7	661
600	3.59	.24	703	34.86	.05	670	1474.9	1.7	669
700	3.57	.23	703	34.87	.05	671	1476.4	1.6	670
800	3.55	.21	695	34.87	.05	663	1478.0	1.8	661
900	3.52	.19	663	34.87	.05	637	1479.6	2.1	635
1000	3.51	.16	534	34.87	.05	513	1481.2	1.8	512
1100	3.51	.14	405	34.87	.04	385	1482.9	1.3	384
1200	3.51	.13	374	34.87	.04	355	1484.5	1.1	354
1300	3.52	.13	369	34.88	.04	350	1486.3	1.0	349
1400	3.54	.14	374	34.89	.05	355	1488.1	1.2	354
1500	3.55	.15	393	34.89	.05	390	1489.8	1.4	389
1750	3.45	.16	97	34.90	.03	95	1493.6	.8	95
2000	3.42	.13	95	34.91	.03	93	1497.7	.8	93
2500	3.19	.10	95	34.92	.03	93	1505.3	.7	93
3000	2.77	.13	82	34.92	.03	82	1512.2	.7	82

Figure B-4. OWS BRAVO - Summer

DEPTH	TEMPERATURE			SALINITY			SOUND VELOCITY		
	MEAN	S.D.	NUM	MEAN	S.D.	NUM	MEAN	S.D.	NUM
0	4.88	1.41	337	34.36	.17	337	1469.5	5.8	337
10	4.87	1.40	337	34.36	.17	337	1469.7	5.8	337
20	4.86	1.40	337	34.36	.17	337	1469.8	5.8	337
30	4.80	1.34	337	34.37	.17	336	1469.7	5.6	336
50	4.57	1.18	337	34.41	.16	336	1469.2	5.0	336
75	4.02	.75	337	34.51	.15	336	1467.5	3.3	336
100	3.68	.53	337	34.61	.13	335	1466.6	2.5	335
125	3.61	.48	337	34.67	.11	335	1466.8	2.3	335
150	3.59	.43	337	34.71	.10	335	1467.2	2.1	335
200	3.66	.30	337	34.77	.07	335	1468.4	1.5	335
250	3.74	.22	337	34.81	.05	334	1469.6	1.4	334
300	3.78	.20	337	34.84	.04	332	1470.6	1.3	332
400	3.76	.21	325	34.86	.04	321	1472.3	1.4	320
500	3.71	.20	321	34.86	.04	318	1473.7	1.3	317
600	3.67	.19	321	34.87	.04	322	1475.2	1.1	319
700	3.64	.19	318	34.87	.04	314	1476.7	1.1	312
800	3.61	.18	312	34.87	.04	307	1478.3	1.3	306
900	3.58	.16	292	34.87	.04	289	1479.8	1.4	287
1000	3.55	.14	221	34.87	.04	220	1481.3	1.2	218
1100	3.54	.13	152	34.87	.03	151	1483.0	.7	151
1200	3.54	.12	136	34.88	.03	136	1484.7	.9	136
1300	3.55	.12	137	34.88	.03	137	1486.4	.9	137
1400	3.57	.13	136	34.89	.03	136	1488.2	.8	136
1500	3.58	.12	134	34.89	.03	134	1489.9	1.0	134
1750	3.57	.07	39	34.92	.03	39	1494.1	.6	39
2000	3.52	.05	39	34.93	.02	39	1498.2	.5	39
2500	3.20	.11	39	34.93	.02	39	1505.4	.7	39
3000	2.81	.13	31	34.93	.01	31	1512.3	.6	31

Figure B-5. OWS BRAVO - Autumn

APPENDIX C

OCEAN WEATHER STATION CHARLIE - (52°45'N,35°30'W)

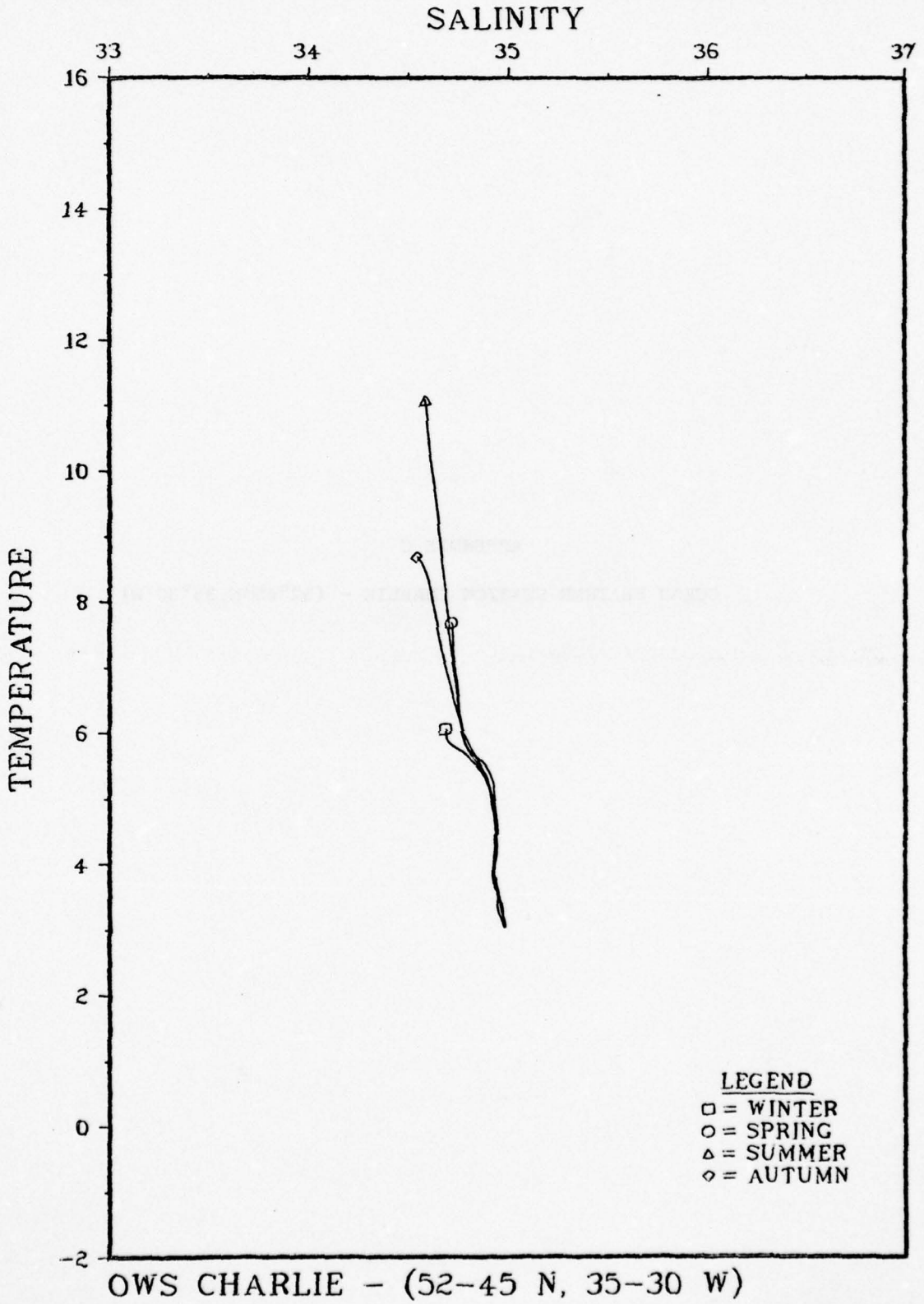

SALINITY
33
34
35
36
37
TEMPERATURE
16
14
12
10
8
6
4
2
0
-2
LEGEND
□ = WINTER
○ = SPRING
△ = SUMMER
◇ = AUTUMN
OWS CHARLIE - (52-45 N, 35-30 W)

Figure C-1.

DEPTH	TEMPERATURE			SALINITY			SOUND VELOCITY		
	MEAN	S.D.	NUM	MEAN	S.D.	NUM	MEAN	S.D.	NUM
0	6.05	.79	259	34.68	.08	259	1474.8	3.3	259
10	6.04	.79	259	34.69	.08	259	1474.9	3.3	259
20	6.03	.79	259	34.69	.08	259	1475.1	3.3	259
30	6.02	.78	259	34.69	.08	259	1475.2	3.2	259
50	5.97	.74	259	34.69	.08	259	1475.3	3.1	259
75	5.88	.67	259	34.69	.08	259	1475.4	2.8	259
100	5.81	.64	259	34.71	.08	259	1475.5	2.8	259
125	5.75	.62	259	34.74	.07	259	1475.8	2.7	259
150	5.70	.61	259	34.77	.07	257	1476.0	2.7	257
200	5.52	.55	259	34.83	.07	256	1476.2	2.5	256
250	5.35	.48	258	34.87	.06	256	1476.4	2.2	255
300	5.16	.41	258	34.90	.05	255	1476.5	2.0	254
400	4.80	.30	241	34.92	.04	243	1476.7	1.5	239
500	4.50	.22	239	34.93	.04	242	1477.1	1.3	237
600	4.28	.17	240	34.93	.04	243	1477.8	1.2	238
700	4.10	.14	243	34.93	.04	244	1478.7	1.1	239
800	3.97	.11	241	34.92	.03	238	1479.8	1.3	236
900	3.86	.09	227	34.92	.04	224	1481.0	1.0	224
1000	3.78	.08	166	34.92	.03	164	1482.4	.7	164
1100	3.73	.08	134	34.93	.03	133	1483.9	.7	133
1200	3.68	.08	128	34.93	.03	127	1485.3	.7	127
1300	3.64	.07	128	34.94	.03	127	1486.8	.8	127
1400	3.59	.07	127	34.94	.03	126	1488.3	.8	126
1500	3.54	.06	127	34.95	.03	126	1489.8	1.0	126
1750	3.40	.09	14	34.94	.02	13	1493.4	.5	13
2000	3.26	.08	12	34.95	.02	11	1497.1	.5	11
2500	3.09	.05	12	34.97	.02	11	1504.9	.4	11
3000	3.00	.06	9	34.98	.02	8	1513.2	.3	8

Figure C-2. OWS CHARLIE - Winter

DEPTH	TEMPERATURE			SALINITY			SOUND VELOCITY		
	MEAN	S.D.	NUM	MEAN	S.D.	NUM	MEAN	S.D.	NUM
0	7.68	1.25	519	34.71	.12	520	1481.2	5.0	519
10	7.60	1.20	520	34.72	.11	518	1481.1	4.8	518
20	7.47	1.13	520	34.72	.11	518	1480.8	4.6	518
30	7.27	1.00	520	34.72	.11	518	1480.2	4.2	518
50	6.82	.85	520	34.74	.10	518	1478.8	3.7	518
75	6.33	.75	520	34.75	.10	518	1477.3	3.3	518
100	6.02	.69	520	34.77	.09	517	1476.5	3.1	517
125	5.83	.64	520	34.78	.09	517	1476.1	3.0	517
150	5.71	.62	520	34.80	.08	516	1476.1	3.0	516
200	5.55	.60	519	34.84	.08	515	1476.3	2.8	514
250	5.36	.57	519	34.88	.07	513	1476.4	2.8	512
300	5.19	.48	519	34.90	.06	512	1476.6	2.5	511
400	4.80	.31	504	34.92	.05	496	1476.6	1.8	494
500	4.52	.23	498	34.93	.05	492	1477.2	1.7	491
600	4.29	.18	500	34.93	.04	495	1477.9	1.7	493
700	4.10	.15	497	34.92	.04	493	1478.7	1.8	490
800	3.96	.12	485	34.92	.04	482	1479.8	1.9	478
900	3.85	.10	448	34.92	.05	445	1481.0	1.8	442
1000	3.78	.09	352	34.92	.04	352	1482.4	.9	349
1100	3.71	.09	280	34.92	.04	280	1483.8	1.2	279
1200	3.66	.08	272	34.93	.04	272	1485.2	.8	272
1300	3.61	.08	272	34.93	.04	271	1486.7	.8	271
1400	3.57	.07	273	34.94	.03	272	1488.2	1.0	272
1500	3.52	.07	262	34.94	.03	261	1489.7	1.3	261
1750	3.36	.07	32	34.97	.03	31	1493.3	.5	31
2000	3.25	.07	29	34.97	.03	28	1497.1	.4	28
2500	3.10	.07	27	34.98	.02	26	1505.0	.5	26
3000	3.01	.09	17	34.98	.01	17	1513.2	.5	17

Figure C-3. OWS CHARLIE - Spring

DEPTH	TEMPERATURE			SALINITY			SOUND VELOCITY		
	MEAN	S.D.	NUM	MEAN	S.D.	NUM	MEAN	S.D.	NUM
0	11.07	.99	458	34.58	.13	458	1493.6	3.7	458
10	10.82	1.11	458	34.59	.12	457	1492.9	4.2	457
20	10.41	1.21	458	34.60	.12	457	1491.6	4.6	457
30	9.71	1.35	458	34.63	.11	457	1489.2	5.2	457
50	7.88	1.27	458	34.69	.11	457	1482.8	5.0	457
75	6.52	.85	458	34.74	.10	457	1478.0	3.7	457
100	6.00	.77	458	34.76	.10	457	1476.4	3.5	457
125	5.79	.76	458	34.79	.09	457	1476.0	3.4	457
150	5.68	.76	458	34.82	.08	457	1476.0	3.4	457
200	5.56	.77	458	34.87	.08	455	1476.4	3.5	455
250	5.41	.74	458	34.90	.08	454	1476.6	3.4	454
300	5.21	.65	458	34.92	.07	451	1476.7	3.0	451
400	4.83	.42	438	34.93	.06	432	1476.8	2.2	430
500	4.54	.28	432	34.94	.05	427	1477.2	1.7	424
600	4.31	.20	436	34.94	.05	431	1478.0	1.5	428
700	4.13	.16	438	34.93	.05	435	1478.8	1.8	429
800	3.97	.13	432	34.93	.05	429	1479.9	1.8	425
900	3.86	.11	397	34.93	.05	393	1481.0	1.5	390
1000	3.78	.09	288	34.93	.05	285	1482.4	.9	282
1100	3.71	.08	200	34.93	.06	197	1483.8	1.0	197
1200	3.65	.08	188	34.94	.06	186	1485.2	1.0	186
1300	3.60	.08	186	34.94	.07	185	1486.7	.6	185
1400	3.55	.09	187	34.94	.07	186	1488.2	.7	186
1500	3.50	.09	189	34.95	.07	188	1489.6	1.0	188
1750	3.33	.06	27	34.96	.03	27	1493.2	.5	27
2000	3.22	.07	26	34.97	.03	26	1496.9	.5	26
2500	3.10	.07	25	34.98	.02	25	1505.0	.5	25
3000	3.03	.07	16	34.98	.01	16	1513.3	.4	16

Figure C-4. OWS CHARLIE - Summer

DEPTH	TEMPERATURE			SALINITY			SOUND VELOCITY		
	MEAN	S.D.	NUM	MEAN	S.D.	NUM	MEAN	S.D.	NUM
0	8.69	1.11	300	34.54	.14	300	1484.9	4.3	300
10	8.67	1.10	300	34.55	.14	297	1485.0	4.3	297
20	8.66	1.09	300	34.55	.14	297	1485.1	4.3	297
30	8.62	1.07	300	34.56	.13	297	1485.1	4.2	297
50	8.40	1.00	300	34.59	.12	297	1484.7	3.9	297
75	7.31	.91	300	34.66	.10	297	1481.0	3.7	297
100	6.57	.85	300	34.72	.09	297	1478.6	3.5	297
125	6.09	.73	300	34.76	.07	297	1477.1	3.1	297
150	5.84	.66	299	34.80	.07	297	1476.6	2.8	296
200	5.56	.59	299	34.85	.06	296	1476.4	2.6	295
250	5.38	.54	299	34.88	.06	296	1476.5	2.5	295
300	5.19	.50	296	34.90	.05	296	1476.6	2.3	292
400	4.84	.37	282	34.93	.05	291	1476.8	1.8	277
500	4.56	.27	281	34.94	.05	291	1477.3	1.5	277
600	4.33	.20	284	34.94	.04	291	1478.1	1.3	281
700	4.16	.16	290	34.94	.04	288	1479.0	1.4	285
800	4.01	.13	281	34.93	.04	281	1480.0	1.4	277
900	3.89	.11	265	34.93	.04	262	1481.2	1.1	259
1000	3.81	.09	213	34.93	.04	211	1482.5	.9	209
1100	3.75	.08	167	34.94	.04	166	1484.0	.8	166
1200	3.69	.08	165	34.94	.03	164	1485.4	.8	164
1300	3.64	.08	165	34.94	.03	164	1486.9	.7	164
1400	3.59	.08	165	34.95	.03	164	1488.3	.8	164
1500	3.53	.08	153	34.95	.03	153	1489.8	1.0	153
1750	3.37	.09	41	34.96	.02	41	1493.3	.6	41
2000	3.25	.10	35	34.97	.02	35	1497.1	.7	35
2500	3.10	.07	31	34.98	.02	31	1505.0	.6	31
3000	3.03	.05	24	34.98	.02	24	1513.3	.4	24

Figure C-5. OWS CHARLIE - Autumn

APPENDIX D

OCEAN WEATHER STATION DELTA - (44°00'N,41°00'W)

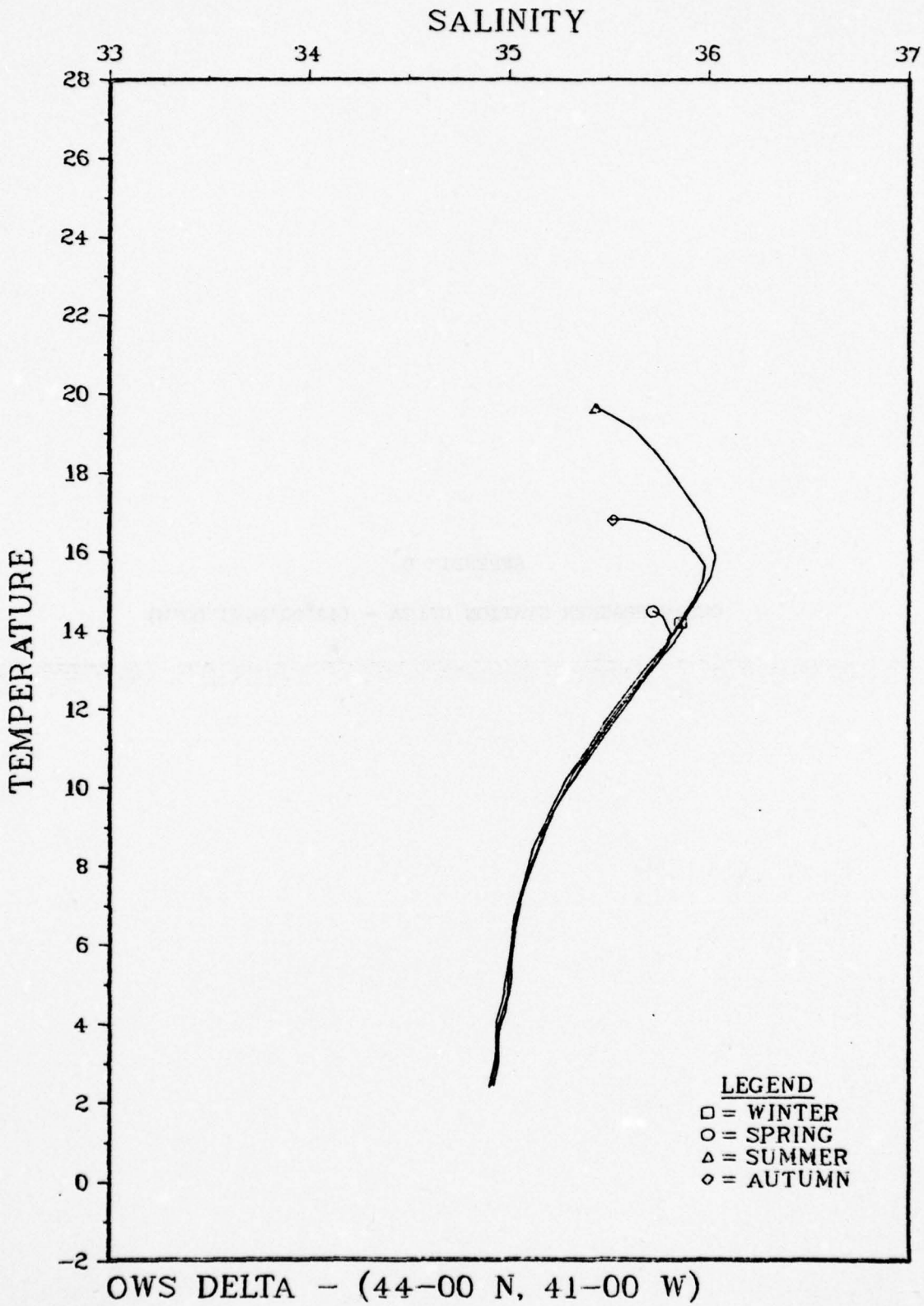

SALINITY
33
34
35
36
37
TEMPERATURE
28
26
24
22
20
18
16
14
12
10
8
6
4
2
0
-2
LEGEND
□ = WINTER
○ = SPRING
△ = SUMMER
◇ = AUTUMN
OWS DELTA - (44-00 N, 41-00 W)

Figure D-1.

DEPTH	TEMPERATURE			SALINITY			SOUND VELOCITY		
	MEAN	S.D.	NUM	MEAN	S.D.	NUM	MEAN	S.D.	NUM
0	14.21	.85	243	35.86	.15	246	1505.9	3.0	243
10	14.21	.85	243	35.86	.15	244	1506.0	3.0	241
20	14.20	.86	243	35.86	.15	244	1506.2	3.0	241
30	14.19	.86	245	35.86	.15	244	1506.3	3.1	243
50	14.16	.87	246	35.86	.14	244	1506.5	3.1	244
75	14.14	.88	245	35.87	.14	244	1506.9	3.1	243
100	14.11	.91	245	35.87	.14	244	1507.2	3.3	243
125	14.06	.93	245	35.87	.14	244	1507.4	3.3	243
150	14.01	.93	245	35.87	.14	244	1507.7	3.4	243
200	13.85	.89	244	35.85	.14	240	1507.9	3.3	238
250	13.66	.92	243	35.82	.15	239	1508.1	3.4	236
300	13.43	1.00	243	35.78	.17	239	1508.1	3.6	236
400	12.53	1.28	235	35.64	.21	229	1506.5	4.8	225
500	11.09	1.57	236	35.43	.23	229	1502.9	6.0	228
600	9.33	1.57	235	35.22	.18	227	1497.9	6.1	227
700	7.75	1.25	232	35.10	.11	224	1493.6	5.0	224
800	6.52	.85	218	35.03	.06	210	1490.4	3.5	210
900	5.71	.55	189	35.01	.05	182	1488.8	2.4	182
1000	5.17	.39	139	35.00	.05	134	1488.2	1.8	134
1100	4.86	.31	91	35.00	.04	90	1488.6	1.4	90
1200	4.61	.28	74	34.99	.04	74	1489.3	1.3	74
1300	4.40	.24	69	34.99	.04	69	1490.1	1.2	69
1400	4.25	.21	67	34.98	.04	67	1491.1	1.0	67
1500	4.12	.17	62	34.97	.04	62	1492.2	1.0	62
1750	3.83	.10	18	34.95	.02	18	1495.2	.6	18
2000	3.67	.08	15	34.95	.03	15	1498.8	.4	15
2500	3.37	.06	15	34.95	.02	15	1506.1	.3	15
3000	3.04	.06	14	34.95	.03	14	1513.3	.4	14
4000	2.42	.05	9	34.92	.04	9	1528.1	.3	9

Figure D-2. OWS DELTA - Winter

DEPTH	TEMPERATURE			SALINITY			SOUND VELOCITY		
	MEAN	S.D.	NUM	MEAN	S.D.	NUM	MEAN	S.D.	NUM
0	14.50	1.73	421	35.72	.34	427	1506.5	6.0	421
10	14.42	1.64	421	35.75	.31	422	1506.4	5.8	416
20	14.35	1.58	421	35.77	.30	422	1506.4	5.6	416
30	14.22	1.46	425	35.78	.29	422	1506.2	5.3	420
50	14.03	1.35	427	35.80	.28	422	1505.9	5.0	422
75	13.90	1.22	427	35.81	.26	422	1505.9	4.6	422
100	13.77	1.16	427	35.80	.24	421	1505.9	4.4	421
125	13.65	1.14	427	35.80	.23	421	1505.9	4.3	421
150	13.54	1.14	427	35.78	.22	421	1506.0	4.4	421
200	13.23	1.31	427	35.75	.24	419	1505.7	5.1	419
250	12.84	1.62	426	35.69	.27	418	1505.1	6.2	417
300	12.38	1.89	424	35.63	.29	415	1504.2	7.3	412
400	11.21	2.07	406	35.46	.27	398	1501.5	8.1	393
500	9.58	1.91	400	35.25	.21	393	1497.1	7.5	389
600	8.02	1.55	392	35.11	.14	385	1492.8	6.2	382
700	6.72	1.12	391	35.03	.10	379	1489.4	4.6	377
800	5.84	.77	380	35.01	.07	363	1487.5	3.3	362
900	5.26	.56	346	34.99	.06	325	1486.8	2.4	324
1000	4.82	.43	270	34.98	.05	259	1486.7	2.0	258
1100	4.48	.32	164	34.96	.04	161	1487.0	1.4	161
1200	4.28	.25	140	34.95	.03	138	1487.8	1.2	138
1300	4.11	.18	137	34.94	.04	135	1488.8	.9	135
1400	4.00	.15	134	34.94	.03	132	1490.0	1.0	132
1500	3.91	.13	125	34.94	.03	123	1491.3	.8	123
1750	3.77	.10	62	34.94	.02	60	1494.9	.8	60
2000	3.65	.07	50	34.94	.02	50	1498.7	.6	50
2500	3.35	.06	48	34.94	.02	48	1506.0	.6	48
3000	3.02	.06	47	34.93	.02	47	1513.2	.5	47
4000	2.39	.04	16	34.90	.01	16	1527.9	.3	16

Figure D-3. OWS DELTA - Spring

DEPTH	TEMPERATURE			SALINITY			SOUND VELOCITY		
	MEAN	S.D.	NUM	MEAN	S.D.	NUM	MEAN	S.D.	NUM
0	19.67	2.00	497	35.43	.48	504	1521.5	6.1	497
10	19.43	1.85	497	35.52	.39	504	1521.2	5.6	497
20	19.13	1.80	498	35.62	.36	504	1520.6	5.4	498
30	18.46	1.74	504	35.74	.32	504	1519.0	5.3	504
50	16.87	1.62	504	35.97	.27	504	1515.0	5.2	504
75	15.88	1.33	504	36.03	.24	502	1512.5	4.6	502
100	15.37	1.25	504	36.01	.23	501	1511.3	4.4	501
125	15.01	1.16	504	35.97	.21	501	1510.5	4.2	501
150	14.69	1.09	504	35.93	.20	500	1509.9	4.0	500
200	14.15	.98	504	35.86	.17	500	1508.9	3.7	500
250	13.68	.94	503	35.79	.17	499	1508.1	3.6	498
300	13.22	.99	502	35.73	.17	496	1507.4	3.9	494
400	12.11	1.20	488	35.56	.19	484	1505.0	4.7	480
500	10.48	1.42	478	35.34	.19	474	1500.6	5.6	470
600	8.84	1.40	460	35.17	.16	454	1496.1	5.6	452
700	7.44	1.23	444	35.08	.12	437	1492.3	5.0	433
800	6.41	.97	431	35.04	.08	413	1489.9	4.2	411
900	5.70	.68	397	35.02	.06	379	1488.7	3.0	377
1000	5.18	.48	309	35.01	.06	298	1488.2	2.2	296
1100	4.77	.33	205	35.00	.04	197	1488.2	1.5	197
1200	4.50	.24	187	34.98	.04	182	1488.8	1.1	182
1300	4.29	.19	177	34.97	.04	173	1489.6	1.0	173
1400	4.13	.16	167	34.96	.06	163	1490.6	1.0	163
1500	4.00	.14	153	34.95	.05	149	1491.7	.7	149
1750	3.82	.12	41	34.94	.03	39	1495.2	.8	39
2000	3.69	.10	32	34.94	.03	30	1498.8	.6	30
2500	3.37	.07	31	34.94	.02	30	1506.0	.5	30
3000	3.01	.08	30	34.93	.02	30	1513.1	.5	30
4000	2.40	.06	10	34.90	.01	10	1528.0	.3	10

Figure D-4. OWS DELTA - Summer

DEPTH	TEMPERATURE			SALINITY			SOUND VELOCITY		
	MEAN	S.D.	NUM	MEAN	S.D.	NUM	MEAN	S.D.	NUM
0	16.82	1.32	436	35.52	.39	440	1513.5	4.1	436
10	16.83	1.33	436	35.51	.35	378	1514.0	4.4	374
20	16.84	1.34	436	35.54	.31	378	1514.2	4.4	374
30	16.84	1.33	439	35.58	.29	378	1514.4	4.4	377
50	16.74	1.28	440	35.69	.26	378	1514.5	4.3	378
75	16.19	1.16	439	35.90	.26	378	1513.5	4.1	377
100	15.63	1.24	438	35.98	.24	378	1512.2	4.5	376
125	15.24	1.21	438	35.97	.22	378	1511.3	4.5	376
150	14.88	1.13	438	35.94	.20	377	1510.6	4.2	375
200	14.25	.97	437	35.86	.17	376	1509.2	3.7	373
250	13.73	.90	434	35.79	.16	377	1508.2	3.5	371
300	13.22	.94	430	35.71	.16	376	1507.1	3.7	366
400	11.99	1.18	409	35.53	.19	361	1504.2	4.6	343
500	10.28	1.36	404	35.30	.18	353	1499.4	5.4	337
600	8.57	1.30	410	35.13	.14	350	1494.5	5.2	343
700	7.21	1.06	398	35.06	.09	335	1490.9	4.3	329
800	6.24	.79	363	35.03	.07	311	1488.9	3.3	307
900	5.61	.59	347	35.02	.06	296	1488.0	2.6	294
1000	5.12	.43	279	35.02	.06	235	1487.8	1.9	232
1100	4.73	.28	214	35.00	.05	176	1487.9	1.2	175
1200	4.46	.22	198	34.98	.04	160	1488.5	1.0	160
1300	4.25	.17	184	34.97	.04	148	1489.3	.9	148
1400	4.10	.15	177	34.96	.04	141	1490.3	.9	141
1500	3.98	.13	158	34.95	.04	125	1491.5	.8	125
1750	3.84	.10	27	34.95	.03	27	1495.2	.5	27
2000	3.68	.05	23	34.95	.03	23	1498.8	.3	23
2500	3.39	.05	22	34.95	.03	22	1506.1	.3	22
3000	3.04	.07	19	34.94	.03	19	1513.3	.4	19
4000	2.43	.06	10	34.91	.01	10	1528.1	.4	10

Figure D-5. OWS DELTA - Autumn

APPENDIX E

OCEAN WEATHER STATION ECHO - (35°00'N,48°00'W)

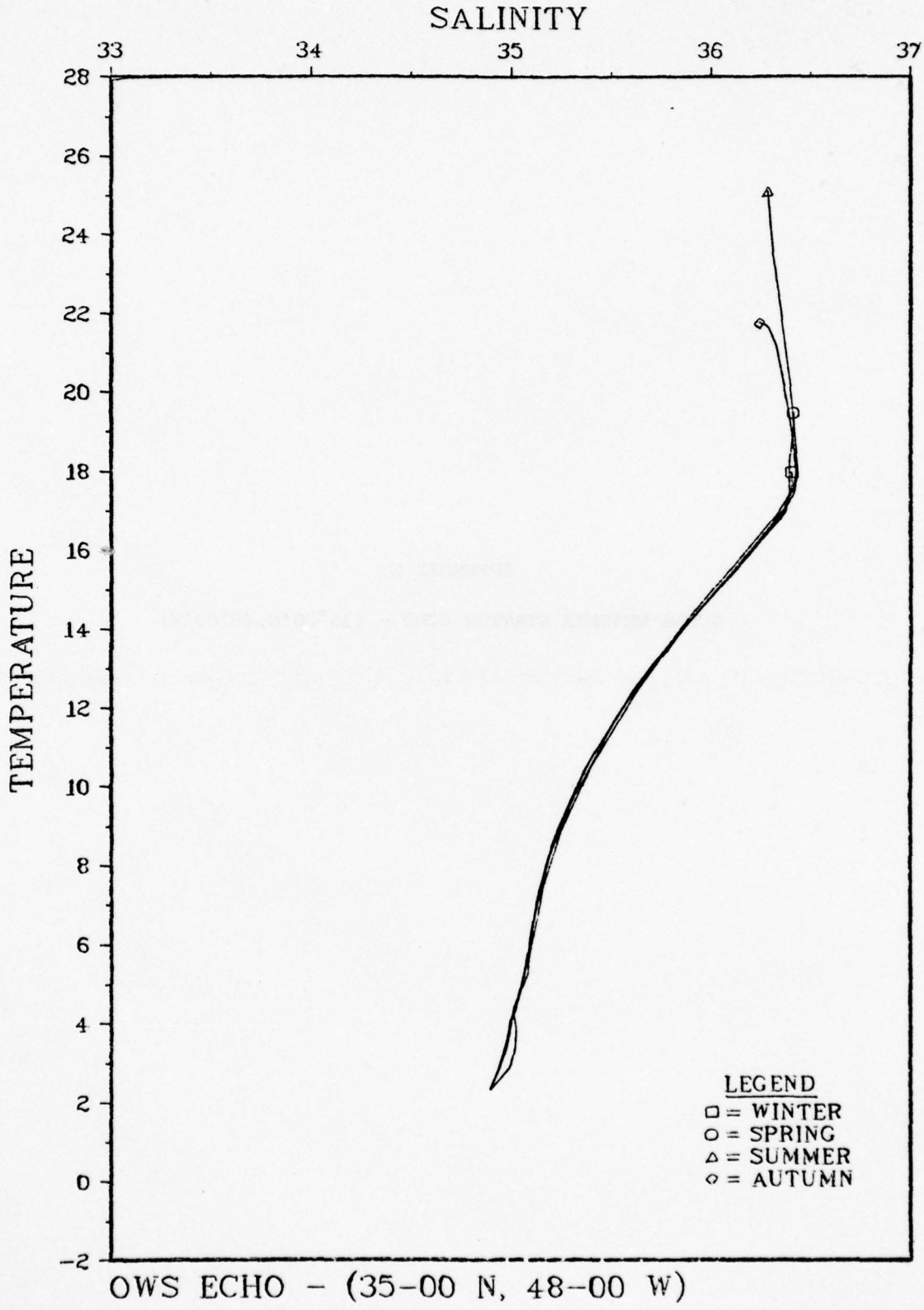

SALINITY
33
34
35
36
37
28
26
24
22
20
18
16
14
12
10
8
6
4
2
0
-2
TEMPERATURE
LEGEND
□ = WINTER
○ = SPRING
△ = SUMMER
◇ = AUTUMN
OWS ECHO - (35-00 N, 48-00 W)

Figure E-1.

DEPTH	TEMPERATURE			SALINITY			SOUND VELOCITY		
	MEAN	S.D.	NUM	MEAN	S.D.	NUM	MEAN	S.D.	NUM
0	17.98	.62	347	36.40	.07	349	1518.1	2.1	347
10	17.97	.62	347	36.40	.07	337	1518.2	2.2	335
20	17.95	.63	347	36.40	.07	337	1518.3	2.2	335
30	17.93	.64	349	36.40	.07	337	1518.5	2.2	337
50	17.90	.64	349	36.40	.07	337	1518.7	2.2	337
75	17.86	.63	349	36.40	.07	337	1519.0	2.1	337
100	17.81	.61	349	36.40	.07	337	1519.2	2.1	337
125	17.73	.57	349	36.40	.07	336	1519.4	2.0	336
150	17.65	.55	348	36.40	.07	336	1519.6	2.0	335
200	17.43	.59	346	36.39	.08	336	1519.7	2.2	333
250	17.19	.70	342	36.36	.11	336	1519.8	2.5	329
300	16.87	.86	341	36.32	.15	337	1519.6	3.0	329
400	15.92	1.24	339	36.16	.22	331	1518.1	4.3	324
500	14.43	1.49	341	35.91	.24	329	1514.6	5.2	327
600	12.51	1.69	335	35.62	.24	323	1509.4	6.1	320
700	10.48	1.71	325	35.37	.19	311	1503.7	6.3	309
800	8.64	1.50	315	35.21	.13	306	1498.4	5.7	301
900	7.24	1.17	295	35.13	.09	282	1494.7	4.5	279
1000	6.22	.82	238	35.10	.07	227	1492.4	3.4	226
1100	5.52	.61	175	35.07	.06	167	1491.3	2.5	167
1200	5.06	.47	152	35.05	.05	146	1491.1	2.0	146
1300	4.76	.39	144	35.04	.05	138	1491.5	1.8	138
1400	4.52	.33	134	35.02	.04	129	1492.2	1.6	129
1500	4.32	.24	100	35.01	.03	98	1493.1	1.2	98
1750	3.91	.12	26	34.99	.02	25	1495.6	.6	25
2000	3.68	.08	25	34.98	.02	24	1498.8	.5	24
2500	3.29	.07	24	34.96	.02	23	1505.7	.4	23
3000	2.90	.08	23	34.94	.02	22	1512.6	.6	22
4000	2.32	.04	4	34.89	.01	4	1527.5	.3	4

Figure E-2. OWS ECHO - Winter

DEPTH	TEMPERATURE			SALINITY			SOUND VELOCITY		
	MEAN	S.D.	NUM	MEAN	S.D.	NUM	MEAN	S.D.	NUM
0	19.49	1.80	710	36.41	.12	710	1522.2	5.2	710
10	19.20	1.58	710	36.41	.10	710	1521.6	4.7	710
20	18.82	1.33	710	36.40	.10	710	1520.7	4.1	710
30	18.40	1.06	710	36.39	.10	710	1519.7	3.5	710
50	17.72	.68	710	36.39	.09	710	1518.1	2.7	710
75	17.35	.53	710	36.39	.08	710	1517.4	2.3	710
100	17.19	.48	710	36.38	.09	710	1517.4	2.2	710
125	17.08	.48	710	36.37	.09	710	1517.5	2.1	710
150	16.99	.49	710	36.37	.09	710	1517.6	2.3	710
200	16.78	.60	708	36.34	.12	710	1517.7	2.7	708
250	16.55	.75	706	36.30	.15	710	1517.8	3.1	706
300	16.26	.93	706	36.25	.18	710	1517.7	3.6	706
400	15.45	1.20	698	36.11	.22	702	1516.6	4.4	698
500	14.21	1.41	697	35.89	.23	698	1514.0	5.1	697
600	12.63	1.53	697	35.64	.22	696	1510.1	5.6	696
700	10.75	1.47	684	35.40	.17	689	1504.9	5.6	683
800	8.91	1.21	672	35.23	.11	678	1499.7	4.8	671
900	7.43	.84	660	35.15	.09	666	1495.7	3.6	659
1000	6.33	.61	631	35.10	.08	638	1493.0	2.7	631
1100	5.61	.41	569	35.08	.07	571	1491.8	2.2	568
1200	5.14	.32	560	35.06	.07	559	1491.5	1.9	559
1300	4.81	.25	554	35.04	.06	553	1491.8	1.7	553
1400	4.55	.20	543	35.03	.05	542	1492.4	1.6	542
1500	4.33	.16	509	35.02	.05	508	1493.1	1.5	508
1750	4.03	.11	55	34.99	.02	55	1496.1	.7	55
2000	3.79	.08	53	34.99	.02	53	1499.3	.6	53
2500	3.36	.07	53	34.97	.02	53	1506.0	.5	53
3000	2.91	.08	50	34.94	.02	50	1512.7	.5	50
4000	2.29	.04	8	34.89	.01	8	1527.4	.3	8

Figure E-3. OWS ECHO - Spring

DEPTH	TEMPERATURE			SALINITY			SOUND VELOCITY		
	MEAN	S.D.	NUM	MEAN	S.D.	NUM	MEAN	S.D.	NUM
0	25.10	1.10	396	36.28	.26	399	1536.4	2.9	396
10	24.56	1.20	396	36.29	.24	396	1535.3	3.1	393
20	23.87	1.49	396	36.30	.23	396	1533.8	3.9	393
30	22.74	1.62	396	36.33	.21	396	1531.2	4.2	393
50	20.33	1.51	398	36.39	.13	396	1525.3	4.3	395
75	18.68	1.10	398	36.42	.10	395	1521.3	3.4	394
100	17.97	.81	398	36.43	.08	395	1519.7	2.8	394
125	17.65	.66	398	36.42	.08	394	1519.2	2.5	393
150	17.41	.58	398	36.41	.09	394	1518.9	2.3	393
200	17.06	.62	399	36.37	.11	394	1518.6	2.4	394
250	16.75	.75	399	36.32	.14	393	1518.5	2.9	393
300	16.42	.91	399	36.27	.17	393	1518.2	3.3	393
400	15.49	1.24	384	36.11	.22	378	1516.7	4.4	375
500	14.16	1.43	379	35.88	.23	373	1513.9	5.1	370
600	12.50	1.54	385	35.64	.21	381	1509.6	5.7	378
700	10.61	1.50	386	35.41	.16	370	1504.3	5.7	369
800	8.86	1.26	384	35.25	.11	367	1499.4	5.0	365
900	7.46	.95	354	35.16	.08	336	1495.7	3.9	334
1000	6.43	.71	275	35.12	.07	257	1493.3	3.0	257
1100	5.73	.49	180	35.09	.06	173	1492.2	2.1	173
1200	5.24	.37	158	35.08	.05	157	1491.9	1.7	157
1300	4.87	.30	153	35.05	.04	152	1492.1	1.4	152
1400	4.57	.22	139	35.03	.04	137	1492.5	1.1	137
1500	4.36	.19	115	35.01	.03	114	1493.2	1.0	114
1750	4.01	.12	28	35.00	.02	26	1496.0	.6	26
2000	3.76	.10	25	34.99	.02	24	1499.2	.6	24
2500	3.32	.07	25	34.97	.02	24	1505.8	.4	24
3000	2.88	.08	23	34.94	.02	23	1512.6	.4	23
4000	2.31	.04	11	34.89	.01	11	1527.5	.3	11

Figure E-4. OWS 'ECHO - Summer

DEPTH	TEMPERATURE			SALINITY			SOUND VELOCITY		
	MEAN	S.D.	NUM	MEAN	S.D.	NUM	MEAN	S.D.	NUM
0	21.78	1.82	304	36.24	.18	305	1528.1	4.7	304
10	21.76	1.82	304	36.25	.17	305	1528.3	4.7	304
20	21.75	1.83	304	36.26	.16	305	1528.4	4.7	304
30	21.67	1.76	304	36.28	.14	305	1528.4	4.6	304
50	21.18	1.53	304	36.32	.12	305	1527.5	4.1	304
75	19.63	1.05	305	36.38	.13	305	1523.9	3.1	305
100	18.52	.97	305	36.41	.12	305	1521.3	3.0	305
125	17.96	.85	305	36.42	.11	305	1520.1	2.7	305
150	17.58	.78	304	36.41	.11	305	1519.4	2.7	304
200	17.07	.84	304	36.36	.15	305	1518.6	2.9	304
250	16.66	1.01	301	36.30	.18	304	1518.1	3.5	300
300	16.24	1.18	300	36.23	.21	303	1517.5	4.0	298
400	15.17	1.49	285	36.05	.26	287	1515.6	5.1	282
500	13.68	1.66	284	35.80	.26	284	1512.1	5.9	281
600	11.81	1.76	289	35.53	.23	287	1507.1	6.5	286
700	9.81	1.60	285	35.32	.16	281	1501.5	6.1	278
800	8.11	1.27	284	35.18	.10	276	1496.7	5.1	272
900	6.84	.82	268	35.12	.06	261	1493.4	3.4	257
1000	5.89	.58	214	35.09	.06	210	1491.2	2.5	207
1100	5.27	.45	167	35.06	.05	164	1490.3	1.9	163
1200	4.87	.33	157	35.04	.05	156	1490.4	1.5	155
1300	4.59	.27	155	35.03	.05	154	1490.9	1.3	153
1400	4.35	.21	152	35.02	.05	151	1491.5	1.0	150
1500	4.20	.15	105	35.01	.05	104	1492.6	.9	103
1750	3.94	.11	19	35.02	.05	19	1495.8	.5	18
2000	3.74	.06	16	35.02	.06	16	1499.1	.4	16
2500	3.29	.06	16	35.01	.07	16	1505.8	.3	16
3000	2.86	.07	16	34.99	.07	16	1512.5	.4	16
4000	2.30	.03	5	34.89	.02	5	1527.5	.3	5

Figure E-5. OWS ECHO - Autumn

APPENDIX F

OCEAN WEATHER STATION HOTEL - (38°00'N,71°00'W)

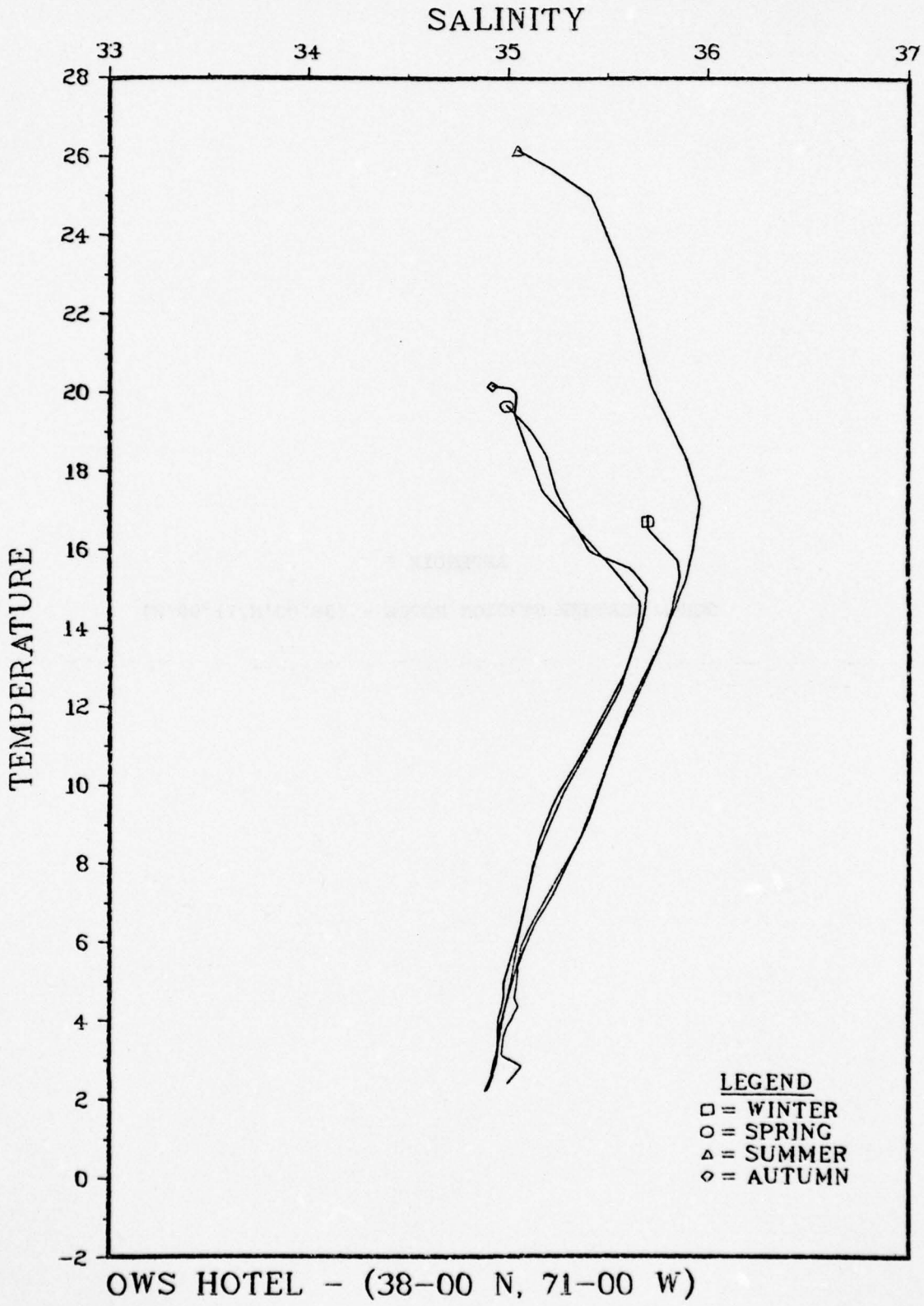

SALINITY
33
34
35
36
37
TEMPERATURE
28
26
24
22
20
18
16
14
12
10
8
6
4
2
0
-2
LEGEND
□ = WINTER
○ = SPRING
△ = SUMMER
◇ = AUTUMN
OWS HOTEL - (38-00 N, 71-00 W)

Figure F-1.

DEPTH	TEMPERATURE			SALINITY			SOUND VELOCITY		
	MEAN	S.D.	NUM	MEAN	S.D.	NUM	MEAN	S.D.	NUM
0	16.72	4.44	91	35.70	.78	95	1512.6	14.5	91
10	16.92	4.48	94	35.70	.76	95	1513.4	14.5	94
20	16.88	4.43	94	35.70	.73	95	1513.4	14.3	94
30	16.77	4.32	94	35.70	.69	95	1513.3	13.8	94
50	16.53	4.13	94	35.70	.64	95	1513.0	13.1	94
75	16.25	3.87	94	35.75	.59	95	1512.7	12.3	94
100	16.01	3.73	94	35.80	.53	95	1512.5	11.8	94
125	15.71	3.72	94	35.85	.49	95	1512.1	11.8	94
150	15.29	3.80	94	35.86	.49	95	1511.2	12.1	94
200	14.00	4.03	95	35.79	.56	94	1507.8	13.4	94
250	12.83	4.25	93	35.69	.62	94	1504.5	14.6	92
300	11.82	4.49	92	35.60	.65	94	1501.7	15.8	91
400	10.51	5.02	82	35.50	.66	85	1497.9	18.0	81
500	9.31	5.20	79	35.42	.62	78	1494.6	18.7	77
600	8.46	4.87	76	35.34	.51	75	1493.1	17.9	74
700	7.26	3.89	73	35.23	.39	73	1491.2	15.0	73
800	6.53	2.91	64	35.14	.25	62	1489.8	11.5	62
900	5.81	2.03	53	35.08	.16	51	1488.7	8.2	51
1000	5.37	1.34	41	35.05	.12	39	1488.8	5.6	39
1100	4.93	.90	31	35.04	.11	29	1488.8	3.9	29
1200	4.54	.61	29	35.03	.09	27	1488.7	2.5	27
1300	4.34	.46	28	35.05	.14	26	1489.7	2.0	26
1400	4.18	.36	28	35.03	.16	27	1490.8	1.5	27
1500	4.05	.28	29	35.02	.14	29	1491.9	1.3	28
1750	3.81	.22	29	34.99	.09	27	1495.1	1.0	26
2000	3.61	.21	28	34.98	.09	25	1498.5	1.0	25
2500	3.10	.24	14	34.97	.05	13	1504.9	1.1	13
3000	2.82	.19	5	35.07	.10	4	1512.3	1.0	4
4000	2.37	.00	1	34.99	.00	1	1528.0	.0	1

Figure F-2. OWS HOTEL - Winter

DEPTH	TEMPERATURE			SALINITY			SOUND VELOCITY		
	MEAN	S.D.	NUM	MEAN	S.D.	NUM	MEAN	S.D.	NUM
0	19.65	5.49	36	34.99	1.10	39	1519.8	17.7	36
10	19.06	5.48	36	35.10	.99	39	1518.4	17.6	36
20	18.37	5.66	37	35.19	.97	39	1516.7	18.2	37
30	17.47	5.83	37	35.24	.92	39	1514.2	18.9	37
50	15.95	5.47	39	35.41	.80	39	1510.3	17.5	39
75	15.54	4.51	39	35.61	.64	39	1510.1	14.3	39
100	14.98	3.75	39	35.70	.50	39	1509.2	11.8	39
125	14.21	3.43	39	35.67	.49	39	1507.2	11.0	39
150	13.46	3.02	39	35.62	.44	39	1505.2	9.9	39
200	12.46	2.93	39	35.56	.42	39	1502.6	10.0	39
250	11.16	2.91	39	35.42	.41	39	1498.8	10.3	39
300	10.03	3.14	38	35.30	.39	39	1495.3	11.3	38
400	8.02	3.09	33	35.13	.28	32	1488.6	10.2	31
500	6.60	2.66	31	35.07	.20	30	1484.6	8.7	29
600	5.75	2.05	29	35.02	.11	27	1483.0	6.5	27
700	5.01	1.19	24	34.98	.03	22	1481.8	3.1	22
800	4.67	.73	23	34.98	.03	22	1482.9	3.0	22
900	4.41	.44	23	34.97	.02	22	1483.4	1.8	22
1000	4.21	.27	22	34.96	.02	22	1484.2	1.2	22
1100	4.09	.16	20	34.95	.02	20	1485.4	.8	20
1200	3.97	.12	19	34.95	.02	20	1486.5	.6	19
1300	3.88	.11	19	34.95	.02	20	1487.8	.6	19
1400	3.81	.11	18	34.95	.02	19	1489.2	.6	18
1500	3.74	.11	20	34.95	.02	20	1490.6	.6	19
1750	3.51	.11	12	34.95	.02	11	1493.8	.5	11
2000	3.37	.10	11	34.95	.02	9	1497.4	.5	9
2500	2.89	.09	6	34.94	.02	6	1504.0	.5	6
3000	2.43	.00	1	34.90	.00	1	1510.6	.0	1
4000	2.19	.00	1	34.88	.00	1	1527.0	.0	1

Figure F-3. OWS HOTEL - Spring

DEPTH	TEMPERATURE			SALINITY			SOUND VELOCITY		
	MEAN	S.D.	NUM	MEAN	S.D.	NUM	MEAN	S.D.	NUM
0	26.14	1.73	198	35.04	.97	200	1537.4	4.8	198
10	25.71	2.12	199	35.20	.80	199	1536.7	5.7	198
20	24.97	2.92	199	35.41	.68	199	1535.2	7.8	198
30	23.27	3.97	199	35.55	.63	199	1531.1	10.8	198
50	20.24	5.15	199	35.71	.60	199	1523.4	14.6	198
75	18.40	4.93	199	35.89	.54	199	1518.9	14.4	198
100	17.19	4.56	199	35.96	.49	199	1516.0	13.7	198
125	16.14	4.27	199	35.93	.51	199	1513.3	13.3	198
150	15.20	4.12	199	35.89	.53	199	1510.8	13.3	198
200	13.67	4.11	199	35.76	.59	197	1506.5	13.9	196
250	12.52	4.30	199	35.65	.62	196	1503.3	15.0	195
300	11.53	4.53	197	35.57	.64	195	1500.5	16.1	192
400	10.12	4.93	188	35.47	.61	183	1496.5	17.9	181
500	8.75	4.68	187	35.37	.53	182	1493.2	17.4	180
600	7.57	3.93	185	35.24	.38	183	1490.7	15.1	182
700	6.58	2.98	178	35.13	.24	175	1488.7	11.8	174
800	5.90	2.09	146	35.07	.14	146	1487.8	8.5	143
900	5.13	1.30	128	35.03	.09	129	1486.3	5.4	126
1000	4.57	.75	112	35.00	.07	111	1485.8	3.2	109
1100	4.18	.42	90	34.98	.05	90	1485.8	1.8	88
1200	4.03	.28	87	34.97	.04	85	1486.8	1.3	85
1300	3.91	.21	83	34.96	.03	81	1488.0	1.0	81
1400	3.83	.18	76	34.96	.02	76	1489.3	.9	76
1500	3.76	.16	77	34.96	.02	77	1490.7	.9	77
1750	3.59	.15	66	34.96	.02	66	1494.2	.8	66
2000	3.42	.15	63	34.95	.02	63	1497.7	.8	63
2500	2.98	.16	48	34.94	.02	48	1504.4	.8	48
3000	2.56	.18	32	34.92	.02	32	1511.2	.9	32
4000	2.21	.05	15	34.89	.02	17	1527.1	.4	15

Figure E-4. OWS HOTEL - Summer

DEPTH	TEMPERATURE			SALINITY			SOUND VELOCITY		
	MEAN	S.D.	NUM	MEAN	S.D.	NUM	MEAN	S.D.	NUM
0	20.16	3.23	101	34.92	.75	101	1522.0	9.3	101
10	20.10	3.19	101	35.01	.65	101	1522.1	9.1	101
20	19.95	3.13	101	35.04	.62	101	1521.9	8.9	101
30	19.44	3.05	101	35.03	.60	101	1520.7	8.7	101
50	17.49	3.14	101	35.17	.56	101	1515.6	9.5	101
75	15.68	2.72	101	35.50	.43	101	1511.0	8.4	101
100	14.66	2.31	100	35.66	.35	100	1508.5	7.3	100
125	13.71	2.14	100	35.64	.29	100	1505.8	6.9	100
150	12.84	2.04	100	35.58	.28	100	1503.3	6.9	100
200	11.12	2.02	100	35.40	.28	100	1498.0	7.1	100
250	9.76	2.05	100	35.25	.27	100	1493.7	7.3	100
300	8.63	2.06	100	35.16	.27	100	1490.2	7.5	100
400	6.85	1.99	85	35.08	.23	84	1484.9	7.5	84
500	5.70	1.35	83	35.04	.15	83	1482.0	5.2	82
600	5.07	1.02	81	35.02	.10	81	1481.2	4.1	80
700	4.71	.71	80	35.00	.06	80	1481.3	2.9	79
800	4.45	.50	57	34.99	.03	57	1481.9	2.1	56
900	4.21	.13	49	34.98	.02	48	1482.6	.6	48
1000	4.08	.13	42	34.98	.02	41	1483.7	.7	41
1100	3.96	.15	29	34.97	.02	28	1484.9	.8	28
1200	3.87	.12	28	34.97	.02	27	1486.2	.7	27
1300	3.80	.11	28	34.97	.02	27	1487.5	.6	27
1400	3.73	.11	28	34.96	.02	27	1488.9	.6	27
1500	3.67	.12	27	34.96	.02	26	1490.3	.7	26
1750	3.49	.10	23	34.95	.02	22	1493.8	.5	22
2000	3.32	.09	20	34.95	.02	20	1497.3	.5	20
2500	2.94	.10	14	34.93	.02	14	1504.2	.6	14
3000	2.44	.11	7	34.91	.01	7	1510.7	.5	7

Figure E-5. OWS HOTEL - Autumn

APPENDIX G

OCEAN WEATHER STATION INDIA - (60°00'N,19°30'W)

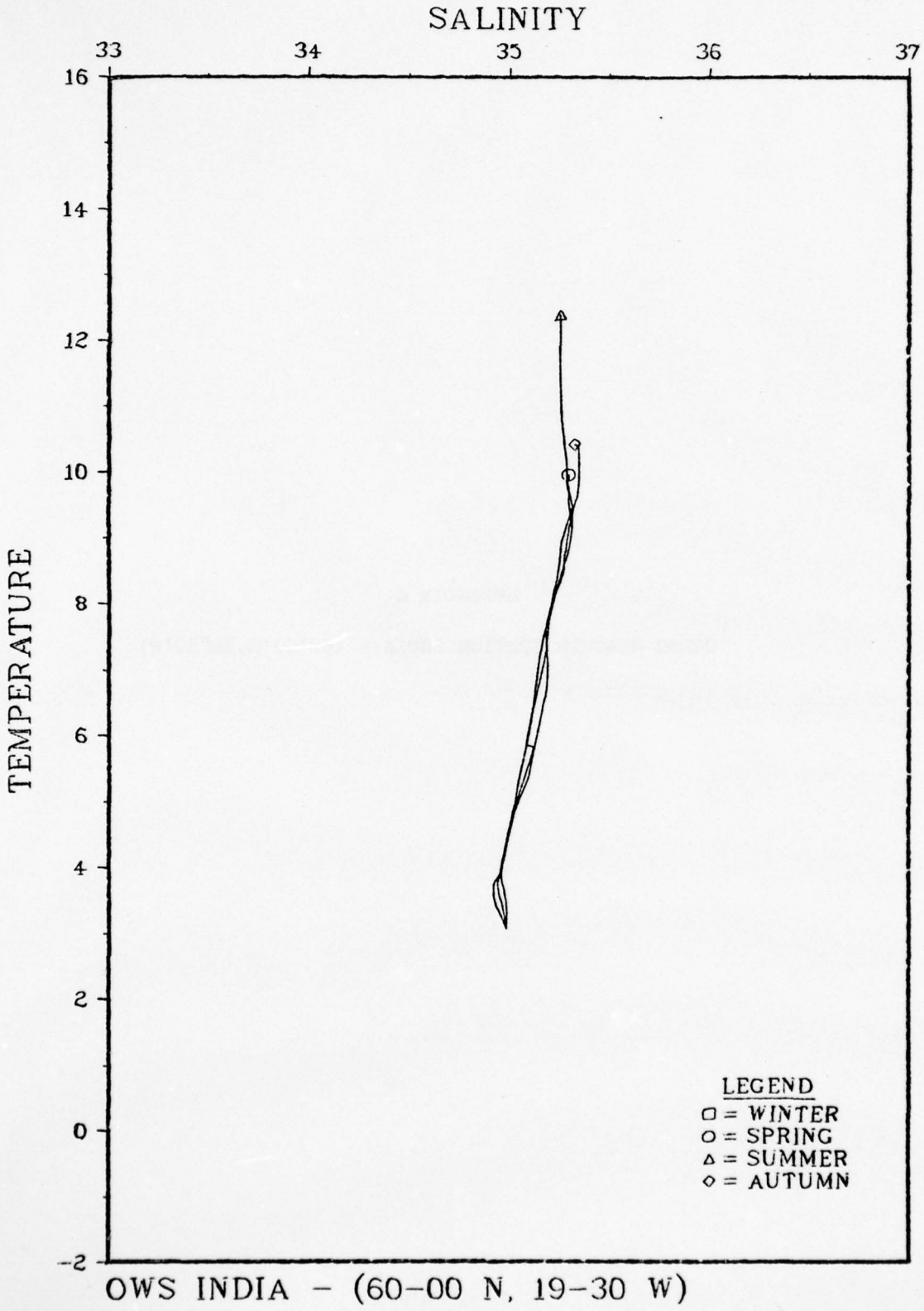

SALINITY
33
34
35
36
37
16
14
12
10
8
6
4
2
0
-2
TEMPERATURE
LEGEND
□ = WINTER
○ = SPRING
△ = SUMMER
◇ = AUTUMN
OWS INDIA - (60-00 N, 19-30 W)

Figure G-1.

DEPTH	TEMPERATURE			SALINITY			SOUND VELOCITY		
	MEAN	S.D.	NUM	MEAN	S.D.	NUM	MEAN	S.D.	NUM
0	9.96	.80	18	35.29	.05	18	1490.6	2.9	18
10	9.87	.77	18	35.29	.04	18	1490.4	2.8	18
20	9.83	.74	18	35.28	.04	18	1490.4	2.8	18
30	9.76	.73	18	35.29	.04	18	1490.3	2.7	18
50	9.59	.75	18	35.29	.05	18	1490.0	2.8	18
75	9.39	.65	18	35.30	.05	18	1489.7	2.5	18
100	9.25	.60	18	35.30	.05	18	1489.6	2.3	18
125	9.16	.58	18	35.29	.05	18	1489.7	2.2	18
150	9.09	.56	18	35.29	.05	18	1489.8	2.1	18
200	8.95	.51	18	35.28	.04	18	1490.1	2.0	18
250	8.85	.50	18	35.28	.04	18	1490.6	2.0	18
300	8.75	.48	18	35.27	.04	18	1491.0	1.8	18
400	8.50	.40	15	35.27	.07	15	1491.7	1.5	15
500	8.11	.34	12	35.22	.05	12	1491.8	1.4	12
600	7.61	.57	9	35.18	.08	10	1491.5	2.3	9
700	7.11	.70	8	35.19	.07	9	1491.3	2.8	8
800	6.72	.75	7	35.18	.08	8	1491.3	3.1	7
900	5.99	.68	7	35.13	.08	8	1490.0	2.8	7
1000	5.37	.56	7	35.09	.08	8	1489.1	2.4	7
1100	5.02	.67	8	35.04	.06	8	1489.3	2.8	8
1200	4.53	.45	8	35.00	.05	8	1488.9	1.9	8
1300	4.17	.29	8	34.97	.03	8	1489.1	1.3	8
1400	3.92	.18	8	34.96	.03	8	1489.7	.8	8
1500	3.75	.08	8	34.92	.02	4	1490.7	.5	4
1750	3.56	.04	4	34.92	.01	4	1494.0	.2	4
2000	3.44	.04	4	34.93	.01	4	1497.9	.2	4
2500	3.08	.03	3	34.98	.00	3	1505.0	.2	3

Figure G-3. OWS INDIA - Spring

DEPTH	TEMPERATURE			SALINITY			SOUND VELOCITY		
	MEAN	S.D.	NUM	MEAN	S.D.	NUM	MEAN	S.D.	NUM
0	12.39	.61	9	35.25	.05	9	1499.1	2.0	9
10	12.04	.47	9	35.25	.05	9	1498.0	1.6	9
20	11.78	.50	9	35.25	.05	9	1497.3	1.7	9
30	11.59	.60	9	35.25	.05	9	1496.8	2.1	9
50	10.81	.15	9	35.26	.06	9	1494.4	.6	9
75	10.24	.21	9	35.28	.06	9	1492.8	.8	9
100	9.87	.25	9	35.28	.06	9	1491.9	1.0	9
125	9.73	.33	9	35.29	.05	9	1491.8	1.3	9
150	9.64	.40	9	35.30	.05	9	1491.9	1.5	9
200	9.48	.40	9	35.31	.06	9	1492.2	1.5	9
250	9.20	.28	9	35.28	.06	9	1491.9	1.0	9
300	8.96	.25	9	35.26	.06	9	1491.8	1.0	9
400	8.63	.30	9	35.25	.05	9	1492.2	1.2	9
500	8.34	.25	9	35.23	.05	9	1492.7	1.0	9
600	7.96	.20	9	35.20	.06	9	1492.9	.8	9
700	7.45	.24	9	35.16	.06	9	1492.6	1.0	9
800	6.53	.24	2	35.12	.02	2	1490.5	1.0	2
900	5.88	.33	2	35.08	.03	2	1489.6	1.4	2
1000	5.33	.33	2	35.04	.04	2	1488.9	1.4	2
1100	4.85	.21	2	35.02	.02	2	1488.6	.9	2
1200	4.47	.11	2	34.99	.01	2	1488.6	.5	2
1300	4.22	.07	2	34.98	.00	2	1489.3	.4	2
1400	4.01	.04	2	34.96	.01	2	1490.1	.2	2
1500	3.83	.02	2	34.96	.02	2	1491.0	.0	2
1750	3.69	.02	2	34.97	.03	2	1494.7	.2	2
2000	3.49	.03	2	34.98	.03	2	1498.1	.2	2
2500	3.03	.00	1	34.98	.00	1	1504.7	.0	1

Figure G-4. OWS INDIA - Summer

DEPTH	TEMPERATURE			SALINITY			SOUND VELOCITY		
	MEAN	S.D.	NUM	MEAN	S.D.	NUM	MEAN	S.D.	NUM
0	10.42	1.00	6	35.32	.06	6	1492.2	3.6	6
10	10.40	.99	6	35.33	.05	6	1492.3	3.6	6
20	10.40	1.00	6	35.33	.06	6	1492.5	3.6	6
30	10.39	1.00	6	35.33	.05	6	1492.6	3.7	6
50	10.38	1.02	6	35.34	.05	6	1492.9	3.7	6
75	10.19	.91	6	35.34	.04	6	1492.7	3.3	6
100	10.10	.88	6	35.34	.03	6	1492.8	3.2	6
125	10.01	.82	6	35.34	.04	6	1492.8	3.0	6
150	9.92	.75	6	35.34	.04	6	1492.9	2.8	6
200	9.64	.55	6	35.33	.03	6	1492.7	2.1	6
250	9.40	.47	6	35.31	.03	6	1492.7	1.8	6
300	9.18	.47	6	35.31	.04	5	1493.1	1.6	5
400	8.81	.41	6	35.29	.04	5	1493.3	1.5	5
500	8.34	.19	5	35.24	.02	3	1493.1	.3	3
600	7.81	.12	4	35.20	.04	3	1492.6	.3	3
700	7.23	.12	3	35.18	.05	2	1491.6	.7	2
800	6.74	.21	3	35.14	.07	2	1491.1	1.0	2
900	6.31	.27	3	35.11	.07	2	1490.9	1.2	2
1000	5.85	.30	2	35.08	.06	2	1491.1	1.4	2
1100	5.83	.00	1	35.12	.00	1	1492.7	.0	1

Figure G-5. OWS INDIA - Autumn

APPENDIX H

OCEAN WEATHER STATION JULIETT - (53°18'N,19°18'W)

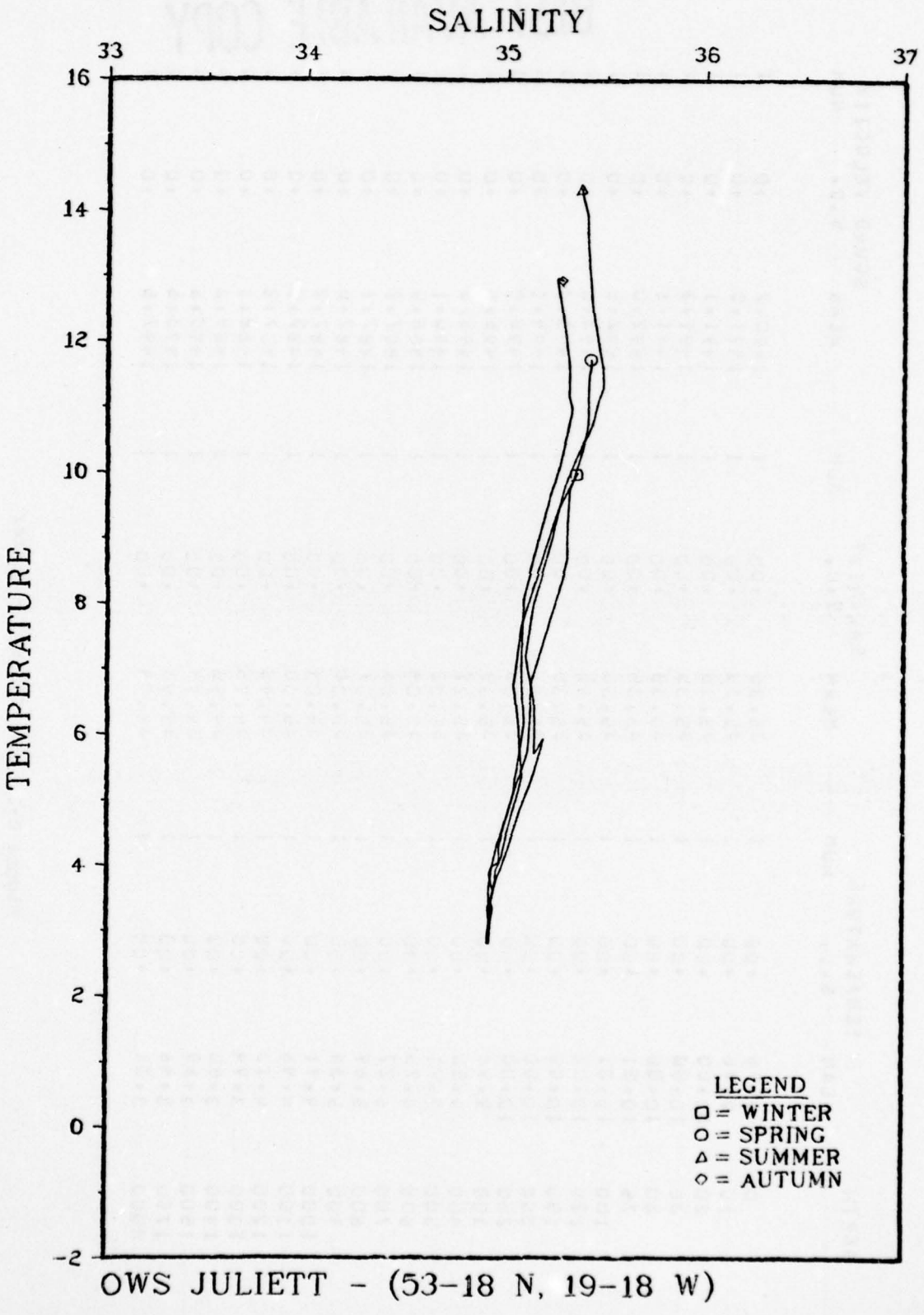

SALINITY
33
34
35
36
37
TEMPERATURE
16
14
12
10
8
6
4
2
0
-2
LEGEND
□ = WINTER
○ = SPRING
△ = SUMMER
◇ = AUTUMN
OWS JULIETT - (53-18 N, 19-18 W)

Figure H-1.

DEPTH	TEMPERATURE			SALINITY			SOUND VELOCITY		
	MEAN	S.D.	NUM	MEAN	S.D.	NUM	MEAN	S.D.	NUM
0	9.98	.00	1	35.35	.00	1	1490.7	.0	1
10	9.98	.00	1	35.35	.00	1	1491.0	.0	1
20	10.00	.00	1	35.35	.00	1	1491.1	.0	1
30	10.00	.00	1	35.35	.00	1	1491.3	.0	1
50	10.00	.00	1	35.35	.00	1	1491.6	.0	1
75	10.01	.00	1	35.35	.00	1	1492.0	.0	1
100	10.01	.00	1	35.35	.00	1	1492.5	.0	1
125	10.02	.00	1	35.35	.00	1	1493.0	.0	1
150	10.02	.00	1	35.36	.00	1	1493.3	.0	1
200	10.00	.00	1	35.36	.00	1	1494.1	.0	1
250	10.00	.00	1	35.35	.00	1	1495.0	.0	1
300	9.98	.00	1	35.35	.00	1	1495.6	.0	1
400	9.50	.00	1	35.27	.00	1	1495.5	.0	1
500	7.71	.00	1	35.08	.00	1	1490.1	.0	1
600	6.75	.00	1	35.04	.00	1	1488.0	.0	1
700	6.27	.00	1	35.06	.00	1	1487.7	.0	1
800	5.69	.00	1	35.07	.00	1	1487.1	.0	1
900	5.38	.00	1	35.08	.00	1	1487.5	.0	1
1000	4.91	.00	1	35.04	.00	1	1487.2	.0	1
1100	4.46	.00	1	35.00	.00	1	1487.0	.0	1
1200	4.13	.00	1	34.98	.00	1	1487.2	.0	1
1300	3.94	.00	1	34.95	.00	1	1488.1	.0	1
1400	3.80	.00	1	34.95	.00	1	1489.2	.0	1
1500	3.69	.00	1	34.94	.00	1	1490.5	.0	1
1750	3.46	.00	1	34.93	.00	1	1493.6	.0	1
2000	3.35	.00	1	34.94	.00	1	1497.5	.0	1

Figure H-2. OWS JULIETT - Winter

DEPTH	TEMPERATURE			SALINITY			SOUND VELOCITY		
	MEAN	S.D.	NUM	MEAN	S.D.	NUM	MEAN	S.D.	NUM
0	11.74	.87	51	35.42	.10	52	1497.0	3.1	51
10	11.62	.85	51	35.42	.10	52	1496.8	3.0	51
20	11.50	.80	51	35.41	.10	52	1496.5	2.9	51
30	11.39	.75	51	35.41	.10	52	1496.3	2.7	51
50	11.19	.70	51	35.41	.11	52	1495.9	2.6	51
75	10.99	.68	51	35.41	.11	52	1495.6	2.6	51
100	10.82	.68	51	35.41	.11	52	1495.4	2.6	51
125	10.66	.68	51	35.40	.11	52	1495.3	2.6	51
150	10.51	.69	52	35.39	.11	52	1495.1	2.7	52
200	10.31	.74	52	35.36	.12	52	1495.2	2.8	52
250	10.09	.83	49	35.33	.12	52	1495.2	3.2	49
300	9.84	.92	48	35.30	.13	52	1495.0	3.6	48
400	9.08	1.12	42	35.24	.13	46	1493.7	4.4	42
500	8.04	1.13	35	35.14	.11	36	1491.4	4.5	35
600	7.19	1.02	33	35.10	.10	33	1489.7	4.0	33
700	6.54	1.26	17	35.14	.10	16	1489.1	5.1	16
800	5.96	1.26	15	35.14	.10	14	1488.5	5.1	14
900	5.69	1.27	12	35.14	.12	12	1488.8	5.2	12
1000	5.97	1.05	6	35.19	.11	5	1492.2	4.5	5
1100	5.33	.92	6	35.13	.10	5	1491.3	3.9	5
1200	4.93	.78	5	35.08	.08	5	1490.7	3.3	5
1300	4.43	.54	5	35.03	.05	5	1490.2	2.3	5
1400	4.07	.38	5	34.99	.03	5	1490.4	1.6	5
1500	3.86	.26	5	34.96	.00	2	1490.8	1.2	2
1750	3.57	.12	2	34.94	.02	2	1494.1	.5	2
2000	3.38	.10	2	34.91	.00	1	1498.0	.0	1
2500	3.19	.00	1	34.92	.00	1	1505.3	.0	1
3000	2.81	.00	1	34.91	.00	1	1512.3	.0	1

Figure H-3. OWS JULIETT - Spring

DEPTH	TEMPERATURE			SALINITY			SOUND VELOCITY		
	MEAN	S.D.	NUM	MEAN	S.D.	NUM	MEAN	S.D.	NUM
0	14.34	.69	131	35.37	.28	131	1505.7	2.3	131
10	14.19	.65	131	35.38	.16	131	1505.4	2.2	131
20	13.95	.70	131	35.40	.09	131	1504.8	2.4	131
30	13.65	.76	131	35.40	.09	131	1504.0	2.5	131
50	12.53	.77	131	35.43	.10	131	1500.6	2.6	131
75	11.62	.52	131	35.48	.09	131	1497.9	1.9	131
100	11.29	.50	131	35.48	.09	131	1497.2	1.9	131
125	11.13	.47	131	35.46	.08	131	1497.0	1.8	131
150	10.98	.46	131	35.45	.08	131	1496.9	1.8	131
200	10.75	.44	130	35.43	.08	131	1496.9	1.7	130
250	10.55	.45	130	35.40	.09	131	1496.9	1.8	130
300	10.33	.50	130	35.38	.09	131	1497.0	2.0	130
400	9.76	.74	118	35.32	.13	119	1496.4	2.9	118
500	9.23	.94	79	35.31	.14	79	1496.1	3.7	79
600	8.71	1.00	51	35.31	.12	51	1495.8	4.0	51
700	6.85	.82	13	35.13	.08	13	1490.1	3.3	13
800	6.26	.73	13	35.12	.08	13	1489.4	3.0	13
900	5.77	.70	13	35.11	.08	13	1489.1	2.9	13
1000	5.23	.58	11	35.05	.05	11	1488.6	2.4	11
1100	4.68	.40	11	35.00	.03	11	1487.9	1.7	11
1200	4.31	.29	9	34.97	.03	9	1488.0	1.3	9
1300	4.06	.23	9	34.97	.07	9	1488.6	1.0	9
1400	3.98	.14	6	34.93	.01	6	1489.9	.6	6
1500	3.87	.08	4	34.92	.01	4	1491.2	.4	4
1750	3.62	.04	3	34.94	.02	3	1494.3	.3	3
2000	3.47	.06	2	34.93	.01	2	1497.9	.2	2
2500	3.12	.00	1	34.90	.00	1	1505.1	.0	1

Figure H-4. OWS JULIETT - Summer

DEPTH	TEMPERATURE			SALINITY			SOUND VELOCITY		
	MEAN	S.D.	NUM	MEAN	S.D.	NUM	MEAN	S.D.	NUM
0	12.94	1.15	6	35.28	.09	6	1500.9	4.0	6
10	12.99	1.21	6	35.25	.09	6	1501.2	4.2	6
20	12.98	1.21	6	35.25	.09	6	1501.4	4.1	6
30	12.94	1.16	6	35.25	.09	6	1501.4	4.0	6
50	12.62	.93	6	35.27	.06	6	1500.7	3.3	6
75	11.70	.50	6	35.31	.08	6	1498.0	1.8	6
100	11.21	.44	6	35.31	.06	6	1496.7	1.5	6
125	10.98	.56	6	35.33	.06	6	1496.3	1.9	6
150	10.71	.68	6	35.31	.05	6	1495.8	2.3	6
200	10.18	.53	6	35.27	.03	6	1494.6	1.9	6
250	9.67	.40	6	35.22	.04	6	1493.5	1.5	6
300	9.19	.50	6	35.18	.06	6	1492.5	1.9	6
400	8.12	.61	6	35.09	.09	6	1490.0	2.4	6
500	7.37	.50	3	35.08	.03	3	1488.8	2.0	3
600	6.89	.55	3	35.08	.01	3	1488.6	2.2	3
700	6.20	.14	2	35.09	.03	2	1487.5	.5	2
800	5.63	.11	2	35.06	.01	2	1486.9	.4	2
900	5.13	.12	2	35.04	.02	2	1486.5	.5	2
1000	4.73	.08	2	35.00	.00	2	1486.4	.3	2
1100	4.38	.04	2	34.96	.00	2	1486.6	.2	2
1200	4.09	.03	2	34.94	.00	2	1487.1	.2	2
1300	3.85	.10	2	34.93	.00	2	1487.7	.4	2
1400	3.73	.09	2	34.92	.00	2	1488.9	.4	2
1500	3.67	.08	2	34.92	.00	2	1490.3	.4	2
1750	3.39	.00	1	34.92	.00	1	1493.3	.0	1
2000	3.11	.00	1	.00	.00	0	.0	.0	0

Figure H-5. OWS JULIETT - Autumn

APPENDIX I

OCEAN WEATHER STATION KILO - (45°00'N,16°00'W)

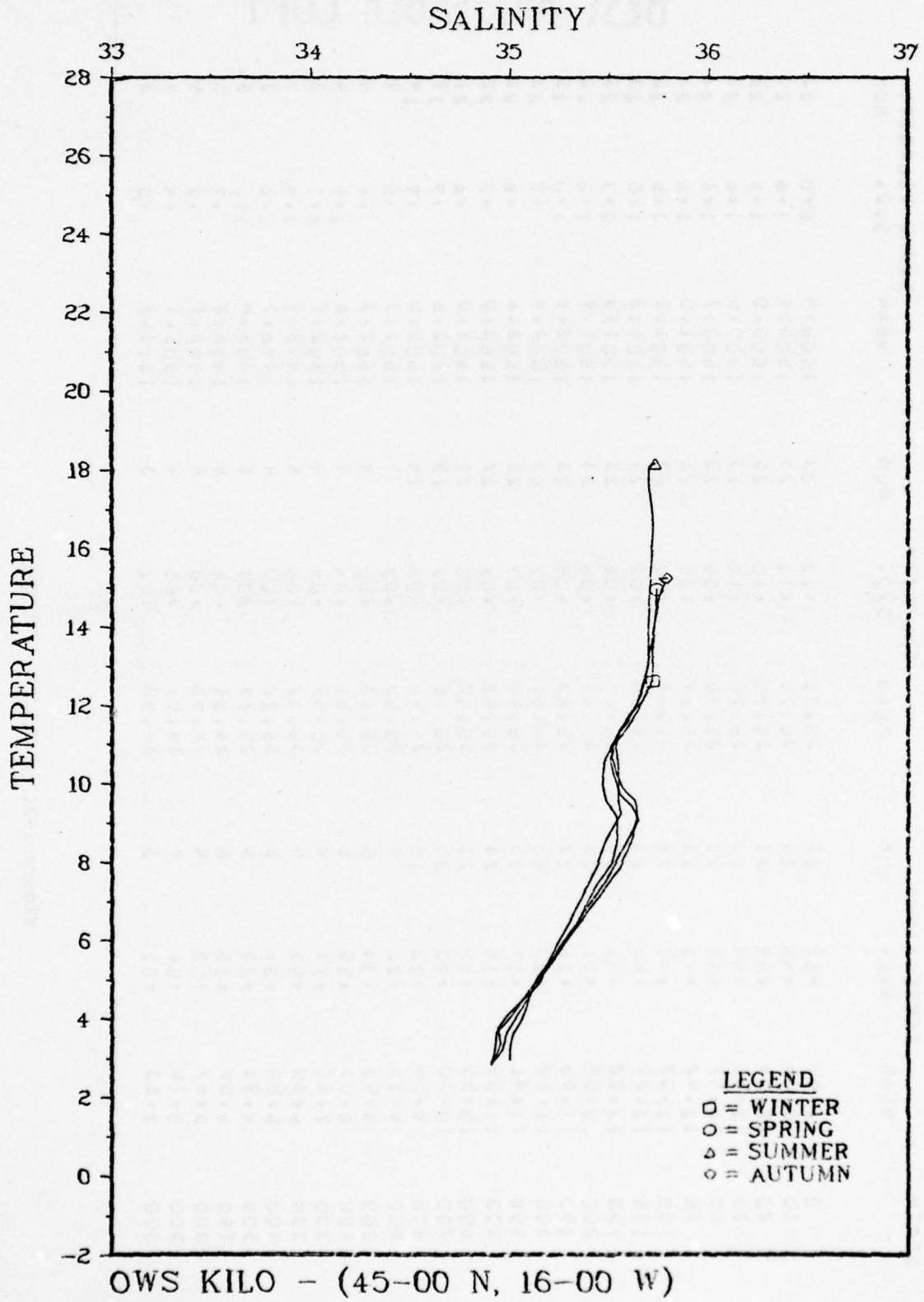

SALINITY
33
34
35
36
37
TEMPERATURE
28
26
24
22
20
18
16
14
12
10
8
6
4
2
0
-2
LEGEND
□ = WINTER
○ = SPRING
△ = SUMMER
◇ = AUTUMN
OWS KILO - (45-00 N, 16-00 W)

Figure I-1.

DEPTH	TEMPERATURE			SALINITY			SOUND VELOCITY		
	MEAN	S.D.	NUM	MEAN	S.D.	NUM	MEAN	S.D.	NUM
0	12.61	.57	23	35.71	.12	23	1500.4	2.0	23
10	12.56	.45	23	35.70	.11	23	1500.4	1.6	23
20	12.55	.44	23	35.70	.10	23	1500.5	1.6	23
30	12.51	.44	23	35.70	.10	23	1500.5	1.6	23
50	12.47	.44	23	35.70	.09	23	1500.7	1.6	23
75	12.42	.43	23	35.69	.09	23	1501.0	1.6	23
100	12.37	.43	23	35.68	.09	23	1501.2	1.5	23
125	12.29	.40	23	35.68	.09	23	1501.3	1.5	23
150	12.22	.35	23	35.67	.08	23	1501.5	1.3	23
200	12.09	.31	23	35.66	.08	23	1501.9	1.2	23
250	11.95	.26	23	35.63	.08	23	1502.2	1.0	23
300	11.80	.23	23	35.61	.07	23	1502.4	.9	23
400	11.41	.19	23	35.56	.07	22	1502.6	.8	22
500	11.05	.18	23	35.52	.06	22	1503.0	.7	22
600	10.55	.15	21	35.47	.05	21	1502.8	.6	21
700	10.00	.23	20	35.46	.07	19	1502.5	.9	19
800	9.56	.23	14	35.48	.06	14	1502.5	.9	14
900	9.15	.22	9	35.53	.07	9	1502.7	.9	9
1000	8.55	.34	5	35.53	.02	4	1502.7	.9	4
1100	8.01	.55	5	35.51	.04	4	1502.6	1.5	4
1200	7.51	.79	4	35.44	.04	4	1502.9	2.1	3
1300	6.30	.43	4	35.32	.05	4	1498.9	1.4	3
1400	5.54	.36	5	35.22	.07	4	1496.7	1.6	3
1500	4.92	.32	6	35.12	.07	6	1495.4	1.3	5
1750	4.09	.15	6	35.01	.06	6	1496.3	.7	5
2000	3.67	.03	4	34.93	.03	4	1498.7	.2	4
2500	3.16	.06	4	34.92	.03	4	1505.1	.4	4
3000	2.83	.01	3	34.90	.02	3	1512.3	.0	3

Figure I-2. OWS KILO - Winter

DEPTH	TEMPERATURE			SALINITY			SOUND VELOCITY		
	MEAN	S.D.	NUM	MEAN	S.D.	NUM	MEAN	S.D.	NUM
0	14.95	1.45	29	35.73	.10	29	1508.0	4.7	29
10	14.72	1.34	29	35.73	.08	29	1507.4	4.4	29
20	14.43	1.18	29	35.72	.08	29	1506.7	3.9	29
30	14.14	1.07	29	35.72	.07	29	1505.9	3.5	29
50	13.37	.76	29	35.71	.07	29	1503.8	2.6	29
75	12.80	.54	29	35.71	.07	29	1502.3	1.9	29
100	12.53	.44	29	35.70	.06	29	1501.7	1.6	29
125	12.36	.42	29	35.68	.05	29	1501.6	1.6	29
150	12.21	.41	29	35.67	.05	29	1501.5	1.5	29
200	12.00	.37	29	35.65	.06	29	1501.5	1.4	29
250	11.83	.33	29	35.63	.06	27	1501.8	1.2	27
300	11.65	.29	29	35.61	.05	27	1502.0	1.1	27
400	11.27	.24	29	35.56	.05	25	1502.3	1.0	25
500	10.94	.31	18	35.51	.05	16	1502.6	1.2	16
600	10.56	.39	15	35.50	.06	15	1502.9	1.5	15
700	10.17	.50	15	35.52	.06	14	1503.1	1.9	14
800	9.72	.67	12	35.55	.08	12	1503.2	2.5	12
900	9.44	.40	8	35.61	.07	10	1503.9	1.6	8
1000	9.07	.50	8	35.64	.08	10	1504.2	1.9	8
1100	8.40	.58	6	35.57	.11	6	1503.3	2.3	6
1200	7.57	.68	6	35.48	.14	6	1501.7	2.8	6
1300	6.69	.60	6	35.36	.11	6	1499.8	2.5	6
1400	5.85	.43	6	35.25	.08	6	1498.0	1.9	6
1500	5.04	.31	6	35.13	.07	6	1496.3	1.4	6
1750	4.12	.17	5	35.07	.08	4	1496.7	1.0	4
2000	3.60	.07	5	35.01	.08	4	1498.5	.3	4
2500	3.24	.05	3	35.00	.00	3	1505.5	.3	3
3000	2.94	.00	2	35.00	.00	2	1513.0	.0	2

Figure I-3. OWS KILO - Spring

DEPTH	TEMPERATURE			SALINITY			SOUND VELOCITY		
	MEAN	S.D.	NUM	MEAN	S.D.	NUM	MEAN	S.D.	NUM
0	18.15	.94	25	35.72	.10	25	1517.7	2.7	25
10	18.05	.91	25	35.69	.11	25	1517.5	2.6	25
20	17.71	.97	25	35.69	.11	25	1516.7	2.9	25
30	16.79	1.19	25	35.71	.10	25	1514.2	3.6	25
50	14.50	1.17	25	35.69	.11	25	1507.4	3.8	25
75	13.20	.68	25	35.69	.10	25	1503.6	2.3	25
100	12.63	.48	25	35.67	.10	25	1502.1	1.7	25
125	12.42	.38	25	35.66	.10	25	1501.8	1.4	25
150	12.24	.34	25	35.65	.10	25	1501.5	1.3	25
200	12.00	.29	25	35.63	.09	25	1501.5	1.1	25
250	11.80	.26	25	35.60	.08	25	1501.6	1.0	25
300	11.64	.23	24	35.58	.07	24	1501.9	.9	23
400	11.29	.20	22	35.54	.07	22	1502.2	.8	21
500	10.98	.23	19	35.52	.06	19	1502.8	.9	19
600	10.63	.24	15	35.51	.08	15	1503.1	.9	15
700	10.27	.30	15	35.53	.10	15	1503.6	1.1	15
800	9.90	.42	13	35.56	.12	13	1503.9	1.6	13
900	9.57	.51	13	35.63	.13	13	1504.4	2.0	13
1000	9.14	.57	13	35.63	.13	12	1504.3	2.2	12
1100	8.57	.64	12	35.61	.17	11	1503.7	2.6	11
1200	7.87	.69	12	35.55	.18	11	1502.8	2.9	11
1300	6.90	.57	12	35.41	.14	11	1500.6	2.5	11
1400	5.93	.48	12	35.27	.11	12	1498.3	2.2	11
1500	5.23	.43	11	35.18	.09	11	1497.1	1.9	10
1750	4.03	.20	8	35.03	.05	6	1496.3	.9	6
2000	3.59	.11	4	34.98	.04	3	1498.4	.6	3
2500	3.20	.03	2	34.96	.00	1	1505.5	.0	1
3000	2.88	.00	1	.00	.00	0	.0	.0	0

Figure I-4. OWS KILO - Summer

DEPTH	TEMPERATURE			SALINITY			SOUND VELOCITY		
	MEAN	S.D.	NUM	MEAN	S.D.	NUM	MEAN	S.D.	NUM
0	15.23	1.17	11	35.78	.09	11	1509.0	3.7	11
10	15.23	1.25	11	35.74	.06	11	1509.0	4.0	11
20	15.17	1.23	11	35.75	.06	11	1509.1	3.9	11
30	15.09	1.17	11	35.77	.10	11	1509.0	3.7	11
50	14.90	1.14	11	35.75	.07	11	1508.7	3.6	11
75	14.11	.69	11	35.72	.06	11	1506.6	2.2	11
100	13.41	.86	11	35.70	.08	11	1504.7	2.8	11
125	12.75	.30	11	35.67	.06	11	1502.9	1.1	11
150	12.33	.23	11	35.65	.07	11	1501.9	.9	11
200	12.05	.26	11	35.63	.06	11	1501.7	1.0	11
250	11.83	.19	11	35.61	.05	11	1501.7	.8	11
300	11.61	.16	11	35.59	.04	11	1501.7	.6	11
400	11.32	.20	10	35.55	.05	10	1502.3	.7	10
500	10.90	.31	9	35.53	.09	9	1502.5	1.2	9
600	10.46	.38	9	35.54	.11	9	1502.6	1.4	9
700	10.04	.37	8	35.54	.11	9	1502.7	1.4	6
800	9.72	.38	7	35.54	.11	9	1503.3	1.5	7
900	9.21	.42	7	35.55	.11	8	1503.0	1.7	7
1000	8.61	.32	4	35.48	.06	6	1502.4	1.3	4
1100	7.98	.45	4	35.44	.09	6	1501.6	1.8	4
1200	7.45	.62	4	35.39	.13	6	1501.2	2.6	4
1300	6.43	.53	5	35.29	.13	6	1498.7	2.3	5
1400	5.68	.40	6	35.21	.14	7	1497.3	1.8	6
1500	4.93	.30	8	35.15	.15	7	1495.9	1.5	7
1750	4.22	.28	8	35.01	.04	6	1496.6	1.1	6
2000	3.78	.16	5	34.94	.04	3	1499.1	.9	3
2500	3.39	.07	2	34.95	.02	2	1506.2	.3	2
3000	3.00	.11	2	34.92	.02	2	1513.1	.4	2
4000	2.60	.00	1	34.90	.00	1	1528.9	.0	1

Figure I-5. OWS KILO - Autumn

APPENDIX J

OCEAN WEATHER STATION MIKE - (66°00'N,02°00'E)

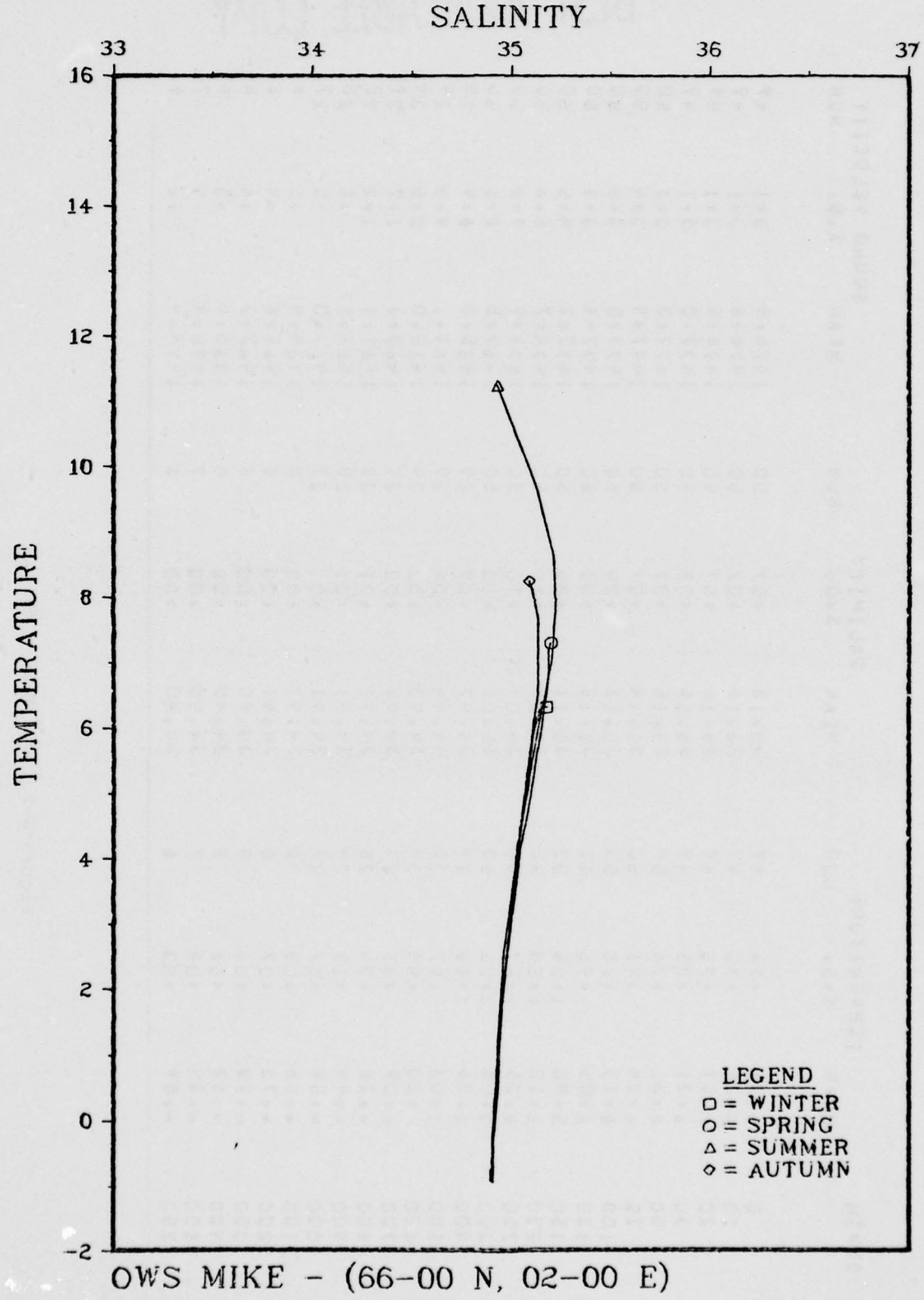

SALINITY
33
34
35
36
37
TEMPERATURE
16
14
12
10
8
6
4
2
0
-2
LEGEND
□ = WINTER
○ = SPRING
△ = SUMMER
◇ = AUTUMN
OWS MIKE - (66-00 N, 02-00 E)

Figure J-1.

DEPTH	TEMPERATURE			SALINITY			SOUND VELOCITY		
	MEAN	S.D.	NUM	MEAN	S.D.	NUM	MEAN	S.D.	NUM
0	6.32	.76	49	35.18	.07	50	1476.5	3.1	49
10	6.31	.75	49	35.16	.07	50	1476.6	3.1	49
20	6.31	.75	49	35.16	.07	50	1476.8	3.1	49
30	6.31	.75	49	35.16	.07	50	1477.0	3.1	49
50	6.31	.76	50	35.15	.07	50	1477.3	3.1	50
75	6.24	.81	50	35.14	.07	50	1477.4	3.4	50
100	6.15	.86	50	35.13	.08	50	1477.5	3.6	50
125	6.05	.95	50	35.12	.08	50	1477.4	3.9	50
150	5.90	1.08	50	35.11	.09	50	1477.2	4.5	50
200	5.10	1.58	50	35.08	.10	50	1474.7	6.6	50
250	4.25	1.87	50	35.04	.10	50	1471.9	7.9	50
300	3.50	2.03	50	35.01	.10	50	1469.5	8.6	50
400	2.26	1.58	29	34.97	.07	29	1465.8	6.9	29
500	1.03	.97	29	34.94	.04	29	1462.1	4.3	29
600	.20	.54	34	34.93	.02	34	1460.0	2.5	34
700	-.09	.35	29	34.92	.02	29	1460.3	1.7	29
800	-.28	.24	28	34.91	.01	28	1461.1	1.2	28
900	-.44	.15	28	34.91	.01	28	1462.1	.8	28
1000	-.59	.07	27	34.91	.01	27	1463.0	.5	27
1100	-.66	.08	8	34.91	.00	8	1464.4	.5	8
1200	-.73	.07	8	34.91	.00	8	1465.8	.4	8
1300	-.78	.06	8	34.90	.00	8	1467.3	.4	8
1400	-.82	.06	8	34.90	.00	8	1468.8	.3	8
1500	-.84	.04	7	34.90	.00	7	1470.4	.4	7
1750	-.89	.03	6	34.90	.00	6	1474.4	.2	6

Figure J-2. OWS MIKE - Winter

DEPTH	TEMPERATURE			SALINITY			SOUND VELOCITY		
	MEAN	S.D.	NUM	MEAN	S.D.	NUM	MEAN	S.D.	NUM
0	7.31	1.09	61	35.20	.07	61	1480.5	4.3	61
10	7.20	1.04	61	35.19	.06	61	1480.2	4.1	61
20	7.07	.97	61	35.19	.06	61	1479.8	3.9	61
30	6.91	.88	61	35.19	.06	61	1479.4	3.6	61
50	6.60	.76	61	35.18	.06	61	1478.5	3.2	61
75	6.23	.88	61	35.16	.07	60	1477.3	3.6	60
100	5.93	1.07	61	35.15	.09	60	1476.5	4.4	60
125	5.66	1.20	61	35.13	.10	60	1475.8	5.1	60
150	5.40	1.34	61	35.12	.10	60	1475.1	5.7	60
200	4.82	1.58	61	35.09	.11	60	1473.5	6.7	60
250	4.24	1.79	61	35.05	.11	60	1471.8	7.6	60
300	3.65	1.92	61	35.03	.11	61	1470.2	8.3	61
400	2.74	1.83	33	34.99	.09	33	1467.9	8.0	33
500	1.46	1.29	28	34.95	.07	28	1464.0	5.7	28
600	.29	.63	54	34.92	.03	54	1460.4	2.9	54
700	-.05	.35	54	34.92	.02	54	1460.5	1.7	54
800	-.31	.19	54	34.91	.02	54	1461.0	1.0	54
900	-.47	.12	54	34.91	.02	54	1461.9	.7	54
1000	-.61	.09	51	34.91	.02	51	1463.0	.6	51
1100	-.70	.06	22	34.91	.01	21	1464.3	.4	21
1200	-.77	.06	22	34.91	.01	21	1465.6	.3	21
1300	-.81	.07	22	34.91	.01	20	1467.1	.4	20
1400	-.85	.06	22	34.91	.01	20	1468.6	.4	20
1500	-.87	.05	21	34.91	.01	19	1470.2	.4	19
1750	-.91	.03	19	34.90	.01	17	1474.3	.3	17
2000	-.94	.02	9	34.91	.01	9	1478.5	.0	9
2500	-.95	.01	3	34.90	.01	3	1487.0	.2	3
3000	-.89	.01	2	34.89	.01	2	1496.0	.0	2

Figure J-3. OWS MIKE - Spring

DEPTH	TEMPERATURE			SALINITY			SOUND VELOCITY		
	MEAN	S.D.	NUM	MEAN	S.D.	NUM	MEAN	S.D.	NUM
0	11.23	.78	123	34.93	.25	123	1494.6	2.8	123
10	10.83	.73	123	34.98	.19	123	1493.4	2.7	123
20	10.30	.75	123	35.05	.14	123	1491.8	2.7	123
30	9.72	.70	123	35.12	.10	123	1489.9	2.6	123
50	8.63	.70	123	35.21	.08	123	1486.4	2.7	123
75	7.91	.76	123	35.22	.08	123	1484.1	3.1	123
100	7.42	.88	123	35.21	.08	123	1482.5	3.6	123
125	7.06	1.02	123	35.20	.08	123	1481.5	4.2	123
150	6.71	1.15	123	35.18	.09	123	1480.5	4.8	123
200	6.11	1.42	122	35.14	.10	122	1478.9	5.9	121
250	5.41	1.70	121	35.10	.11	122	1476.7	7.2	120
300	4.68	1.83	121	35.06	.11	122	1474.5	7.8	120
400	2.66	1.52	84	34.97	.07	86	1467.6	6.6	84
500	1.39	1.03	67	34.94	.05	67	1463.7	4.6	67
600	.61	.64	87	34.93	.04	87	1461.9	3.0	87
700	.23	.43	68	34.92	.03	68	1461.8	2.0	68
800	-.11	.29	65	34.91	.02	65	1461.9	1.4	65
900	-.35	.18	61	34.91	.02	61	1462.5	1.0	61
1000	-.56	.09	57	34.91	.02	57	1463.2	.6	57
1100	-.70	.08	25	34.91	.01	25	1464.3	.5	25
1200	-.77	.08	25	34.91	.01	25	1465.6	.5	25
1300	-.80	.06	19	34.91	.01	19	1467.2	.5	19
1400	-.84	.05	19	34.91	.01	19	1468.7	.4	19
1500	-.87	.04	16	34.91	.01	16	1470.2	.4	16
1750	-.94	.03	14	34.91	.00	14	1474.2	.3	14
2000	-.97	.03	7	34.91	.00	7	1478.3	.3	7
2500	-1.00	.00	3	34.91	.01	3	1486.8	.0	3

Figure J-4. OWS MIKE - Summer

DEPTH	TEMPERATURE			SALINITY			SOUND VELOCITY		
	MEAN	S.D.	NUM	MEAN	S.D.	NUM	MEAN	S.D.	NUM
0	8.25	1.22	64	35.09	.07	64	1483.9	4.6	64
10	8.22	1.19	64	35.09	.06	64	1484.0	4.5	64
20	8.20	1.18	64	35.09	.06	64	1484.0	4.4	64
30	8.17	1.16	64	35.10	.06	64	1484.1	4.4	64
50	8.03	1.00	64	35.11	.08	64	1483.9	3.9	64
75	7.70	.75	64	35.13	.09	64	1483.1	3.0	64
100	7.28	.83	64	35.13	.10	64	1481.9	3.4	64
125	6.93	1.03	64	35.13	.10	63	1481.0	4.2	63
150	6.58	1.26	64	35.13	.11	63	1480.0	5.2	63
200	5.63	1.55	63	35.09	.11	63	1477.0	6.5	62
250	4.64	1.72	63	35.05	.11	63	1473.7	7.3	62
300	3.70	1.74	63	35.02	.10	63	1470.5	7.4	62
400	1.95	1.16	42	34.96	.05	42	1464.5	5.1	42
500	.82	.64	30	34.94	.03	29	1461.3	2.9	29
600	.25	.43	44	34.92	.03	44	1460.2	2.0	44
700	-.01	.27	34	34.92	.02	34	1460.7	1.3	34
800	-.22	.19	32	34.91	.02	32	1461.4	.9	32
900	-.39	.13	32	34.91	.02	32	1462.3	.7	32
1000	-.55	.08	28	34.91	.01	28	1463.2	.5	28
1100	-.65	.05	12	34.90	.01	12	1464.4	.4	12
1200	-.72	.04	11	34.91	.00	11	1465.8	.0	11
1300	-.76	.05	11	34.91	.01	11	1467.3	.3	11
1400	-.80	.07	11	34.91	.00	11	1468.8	.4	11
1500	-.81	.08	11	34.91	.00	11	1470.5	.4	11
1750	-.87	.06	10	34.91	.01	10	1474.5	.4	10
2000	-.91	.03	4	34.90	.01	4	1478.6	.2	4

Figure J-5. OWS MIKE - Autumn

APPENDIX K

OCEAN WEATHER STATION PAPA - (50°00'N,145°00'W)

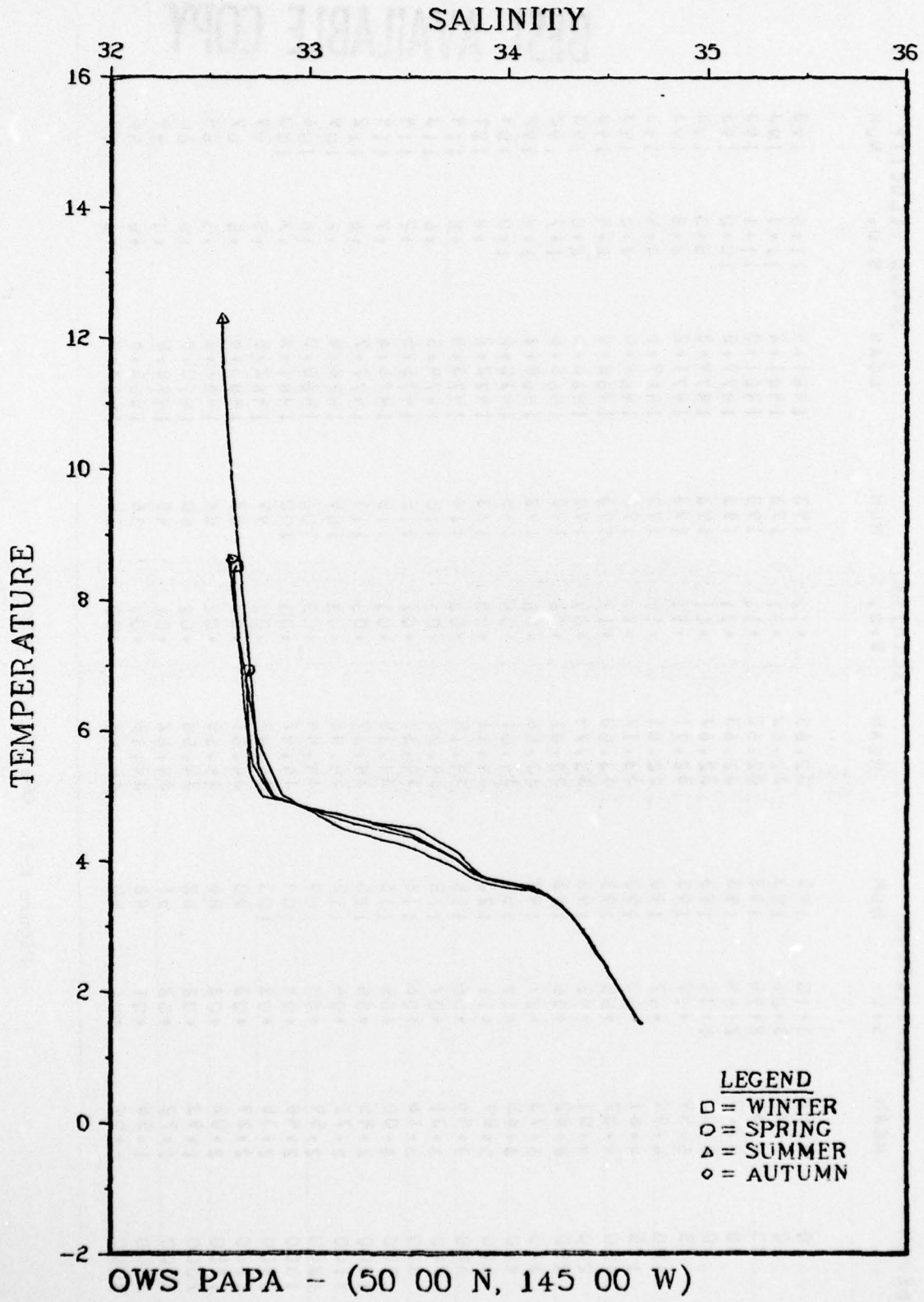

SALINITY
32
33
34
35
36
16
14
12
10
8
6
4
2
0
-2
TEMPERATURE
LEGEND
□ = WINTER
○ = SPRING
△ = SUMMER
◇ = AUTUMN
OWS PAPA – (50 00 N, 145 00 W)

Figure K-1.

DEPTH	TEMPERATURE			SALINITY			SOUND VELOCITY		
	MEAN	S.D.	NUM	MEAN	S.D.	NUM	MEAN	S.D.	NUM
0	8.52	3.10	193	32.63	.12	193	1481.4	11.6	193
10	8.44	3.03	193	32.62	.11	193	1481.2	11.3	193
20	8.34	2.95	193	32.62	.11	193	1481.0	11.1	193
30	7.89	2.64	193	32.63	.11	193	1479.5	10.0	193
50	6.39	1.34	193	32.67	.11	193	1474.3	5.3	193
75	5.49	.69	193	32.71	.11	193	1471.2	2.8	193
100	4.99	.57	193	32.81	.17	193	1469.6	2.4	193
125	4.61	.53	193	33.17	.27	193	1469.0	2.3	193
150	4.37	.55	193	33.50	.19	193	1468.8	2.4	193
200	4.01	.45	193	33.74	.07	193	1468.5	2.0	193
250	3.82	.36	193	33.81	.06	192	1468.6	1.7	192
300	3.73	.27	193	33.88	.05	192	1469.1	1.4	192
400	3.65	.15	155	34.01	.04	155	1470.6	1.0	154
500	3.59	.11	122	34.11	.03	123	1472.2	.8	121
600	3.46	.08	115	34.19	.03	116	1473.4	.8	114
700	3.31	.07	115	34.26	.03	115	1474.5	.6	113
800	3.16	.06	116	34.31	.02	115	1475.5	.7	114
900	3.00	.05	116	34.35	.03	115	1476.6	.7	114
1000	2.85	.05	115	34.39	.03	113	1477.7	.6	112
1100	2.72	.04	112	34.42	.03	109	1478.8	.6	109
1200	2.59	.04	109	34.44	.03	106	1480.0	.6	106
1300	2.48	.04	104	34.47	.03	100	1481.2	.7	100
1400	2.38	.03	103	34.49	.02	99	1482.5	.5	99
1500	2.29	.03	90	34.51	.02	87	1483.8	.5	87
1750	2.08	.03	86	34.55	.02	84	1487.2	.5	84
2000	1.93	.02	62	34.58	.02	60	1490.9	.6	60
2500	1.72	.02	51	34.62	.01	49	1498.5	.3	49
3000	1.58	.01	48	34.65	.01	46	1506.6	.6	46
4000	1.51	.01	40	34.68	.02	38	1523.9	.3	37

Figure K-2. OWS PAPA - Winter

DEPTH	TEMPERATURE			SALINITY			SOUND VELOCITY		
	MEAN	S.D.	NUM	MEAN	S.D.	NUM	MEAN	S.D.	NUM
0	6.93	1.50	42	32.69	.12	42	1475.6	5.9	42
10	6.76	1.41	42	32.67	.10	42	1475.1	5.5	42
20	6.67	1.33	42	32.68	.10	42	1474.9	5.2	42
30	6.51	1.19	42	32.68	.10	42	1474.4	4.7	42
50	5.81	.72	42	32.69	.09	42	1472.0	2.9	42
75	5.33	.43	42	32.70	.09	42	1470.5	1.7	42
100	4.99	.37	42	32.76	.13	42	1469.6	1.6	42
125	4.71	.46	42	33.14	.27	42	1469.3	2.0	42
150	4.41	.58	42	33.50	.19	42	1469.0	2.6	42
200	4.04	.56	42	33.73	.08	42	1468.6	2.4	42
250	3.84	.49	42	33.82	.06	41	1468.7	2.2	41
300	3.76	.37	42	33.88	.05	41	1469.3	1.7	41
400	3.68	.21	30	34.01	.04	30	1470.8	.9	29
500	3.63	.14	25	34.11	.03	25	1472.3	.6	24
600	3.49	.10	23	34.19	.02	23	1473.5	.5	22
700	3.34	.08	23	34.26	.02	22	1474.6	.3	21
800	3.18	.06	24	34.31	.02	22	1475.6	.3	22
900	3.02	.05	24	34.35	.02	22	1476.6	.4	22
1000	2.87	.04	24	34.38	.02	22	1477.7	.3	22
1100	2.72	.04	24	34.42	.02	22	1478.8	.3	22
1200	2.60	.03	24	34.44	.02	23	1480.0	.4	23
1300	2.49	.03	24	34.47	.02	23	1481.2	.0	23
1400	2.38	.03	24	34.50	.02	23	1482.5	.2	23
1500	2.29	.03	20	34.51	.02	19	1483.8	.3	19
1750	2.09	.03	19	34.55	.01	18	1487.2	.3	18
2000	1.93	.03	12	34.58	.01	11	1490.9	.3	11
2500	1.72	.01	9	34.62	.01	8	1498.5	.0	8
3000	1.57	.01	8	34.65	.01	7	1506.6	.2	7
4000	1.51	.01	8	34.67	.01	6	1523.9	.2	6

Figure K-3. OWS PAPA - Spring

DEPTH	TEMPERATURE			SALINITY			SOUND VELOCITY		
	MEAN	S.D.	NUM	MEAN	S.D.	NUM	MEAN	S.D.	NUM
0	12.31	1.14	57	32.56	.10	57	1495.4	4.0	57
10	12.10	1.10	57	32.56	.10	57	1494.8	3.9	57
20	11.85	1.18	57	32.56	.10	57	1494.1	4.1	57
30	10.50	2.05	57	32.59	.10	57	1489.4	7.5	57
50	6.88	1.15	57	32.70	.11	57	1476.3	4.5	57
75	5.46	.54	57	32.74	.10	57	1471.1	2.3	57
100	4.98	.52	57	32.82	.15	57	1469.6	2.2	57
125	4.69	.53	57	33.17	.25	57	1469.3	2.3	57
150	4.50	.57	57	33.53	.18	57	1469.4	2.5	57
200	4.11	.50	57	33.75	.07	57	1468.9	2.2	57
250	3.88	.39	57	33.82	.05	57	1468.8	1.8	57
300	3.76	.31	57	33.88	.05	57	1469.2	1.4	57
400	3.66	.16	46	34.01	.03	46	1470.7	.8	46
500	3.59	.10	38	34.11	.03	39	1472.1	.5	38
600	3.46	.06	37	34.20	.03	38	1473.4	.5	37
700	3.31	.06	37	34.26	.02	38	1474.5	.4	37
800	3.15	.06	37	34.31	.02	38	1475.5	.5	37
900	3.00	.05	37	34.35	.02	38	1476.6	.4	37
1000	2.86	.05	36	34.39	.02	37	1477.7	.5	36
1100	2.72	.05	33	34.42	.02	33	1478.8	.3	33
1200	2.59	.04	33	34.45	.02	32	1480.0	.4	32
1300	2.48	.04	32	34.47	.02	30	1481.2	.4	30
1400	2.37	.04	31	34.49	.02	29	1482.5	.4	29
1500	2.28	.04	27	34.51	.01	25	1483.8	.4	25
1750	2.08	.03	27	34.55	.01	26	1487.2	.4	26
2000	1.93	.03	22	34.58	.01	21	1490.9	.3	21
2500	1.72	.02	18	34.63	.01	17	1498.6	.0	17
3000	1.57	.01	17	34.65	.01	16	1506.6	.4	16
4000	1.50	.01	13	34.68	.01	13	1523.9	.2	12

Figure K-4. OWS PAPA - Summer

DEPTH	TEMPERATURE			SALINITY			SOUND VELOCITY		
	MEAN	S.D.	NUM	MEAN	S.D.	NUM	MEAN	S.D.	NUM
0	8.63	2.41	45	32.61	.10	45	1481.9	9.0	45
10	8.70	2.35	45	32.59	.09	45	1482.3	8.8	45
20	8.71	2.35	45	32.59	.09	45	1482.5	8.8	45
30	8.62	2.24	45	32.59	.09	45	1482.4	8.4	45
50	7.47	1.52	45	32.64	.10	45	1478.5	5.8	45
75	5.92	.98	45	32.73	.13	45	1472.9	3.9	45
100	5.00	.77	45	32.86	.19	45	1469.7	3.2	45
125	4.48	.59	45	33.17	.28	45	1468.4	2.5	45
150	4.25	.50	45	33.46	.21	45	1468.3	2.1	45
200	3.91	.32	45	33.72	.08	45	1468.0	1.4	45
250	3.74	.24	45	33.81	.04	45	1468.3	1.1	45
300	3.67	.13	45	33.88	.04	45	1468.9	.7	45
400	3.60	.10	34	34.00	.04	34	1470.4	.7	34
500	3.56	.08	26	34.11	.03	26	1472.0	.4	26
600	3.45	.06	24	34.19	.02	24	1473.3	.5	24
700	3.31	.05	24	34.26	.02	24	1474.4	.3	24
800	3.15	.04	24	34.31	.02	24	1475.5	.3	24
900	3.00	.05	24	34.35	.02	24	1476.6	.4	24
1000	2.85	.05	24	34.38	.02	23	1477.7	.4	23
1100	2.70	.05	24	34.41	.02	23	1478.8	.3	23
1200	2.58	.04	22	34.44	.02	21	1479.9	.4	21
1300	2.47	.04	20	34.47	.02	19	1481.2	.3	19
1400	2.37	.03	20	34.49	.02	19	1482.5	.2	19
1500	2.28	.03	18	34.50	.01	18	1483.8	.3	18
1750	2.08	.02	18	34.55	.01	18	1487.2	.4	18
2000	1.92	.02	10	34.58	.01	10	1490.8	.2	10
2500	1.71	.01	8	34.62	.01	8	1498.5	.0	8
3000	1.58	.02	8	34.65	.01	8	1506.6	.3	8
4000	1.51	.01	6	34.67	.01	6	1523.9	.2	6

Figure K-4. OWS PAPA - Autumn

APPENDIX L

OCEAN WEATHER STATION VICTOR - (34°00'N,164°00'E)

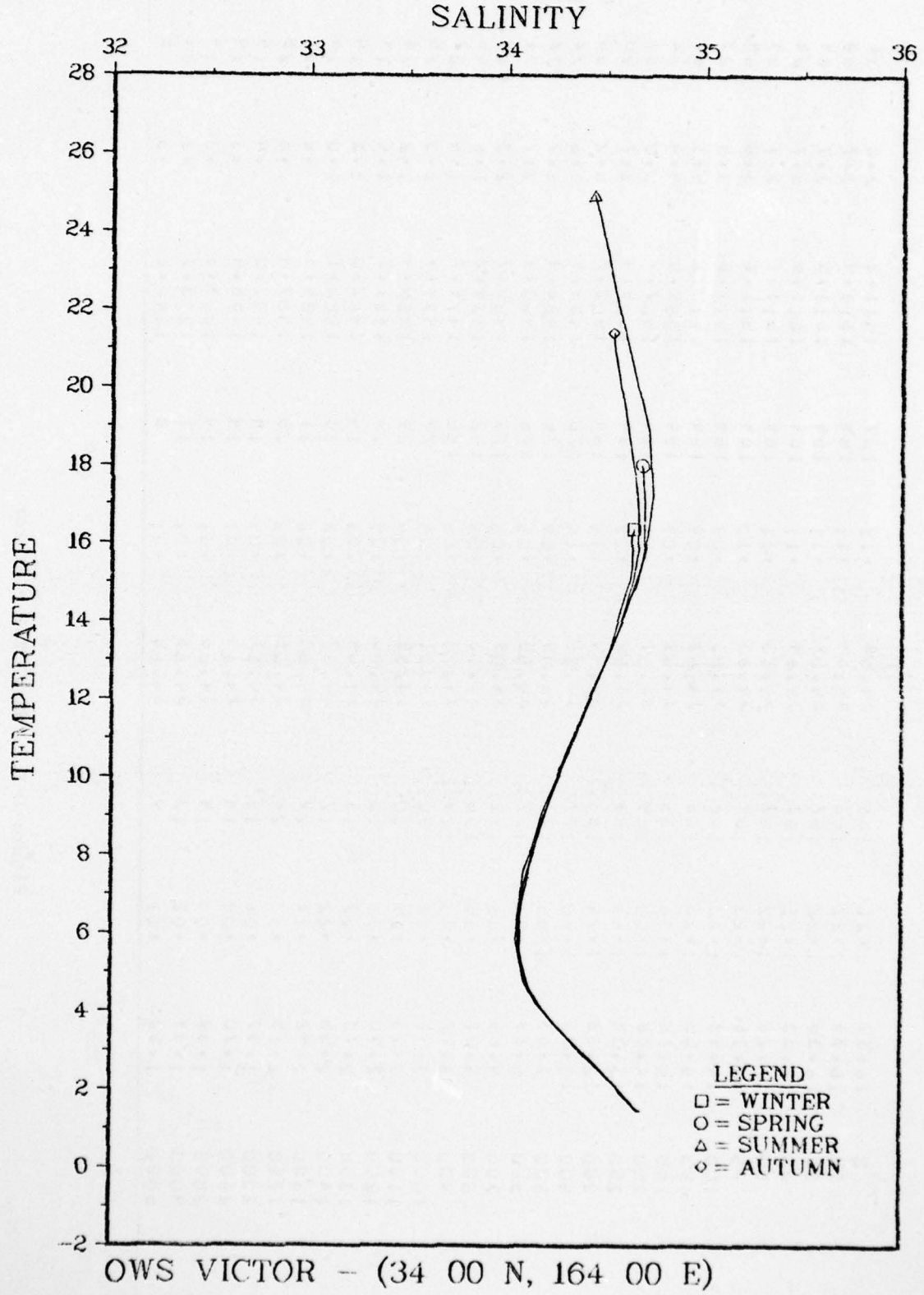

SALINITY
32
33
34
35
36
28
26
24
22
20
18
16
14
12
10
8
6
4
2
0
-2
TEMPERATURE
LEGEND
□ = WINTER
○ = SPRING
△ = SUMMER
◇ = AUTUMN
OWS VICTOR – (34 00 N, 164 00 E)

Figure L-1.

DEPTH	TEMPERATURE			SALINITY			SOUND VELOCITY		
	MEAN	S.D.	NUM	MEAN	S.D.	NUM	MEAN	S.D.	NUM
0	16.39	1.21	186	34.64	.11	187	1511.2	3.8	186
10	16.38	1.22	186	34.64	.11	184	1511.4	3.7	183
20	16.35	1.22	187	34.64	.11	184	1511.5	3.7	184
30	16.33	1.21	187	34.64	.11	184	1511.6	3.7	184
50	16.26	1.22	187	34.63	.11	184	1511.7	3.7	184
75	16.16	1.23	187	34.63	.10	184	1511.8	3.8	184
100	15.92	1.23	186	34.63	.09	184	1511.5	3.8	183
125	15.55	1.28	186	34.63	.09	184	1510.7	4.1	183
150	15.16	1.36	185	34.62	.09	184	1509.8	4.4	182
200	14.26	1.50	184	34.57	.11	184	1507.7	5.0	181
250	13.34	1.65	183	34.52	.12	184	1505.4	5.7	180
300	12.33	1.74	183	34.44	.14	184	1502.7	6.2	180
400	10.02	1.80	177	34.26	.14	176	1495.9	6.8	172
500	7.63	1.45	177	34.09	.09	175	1488.4	5.7	172
600	5.89	.92	177	34.05	.05	176	1483.2	3.7	171
700	4.85	.55	175	34.09	.05	173	1480.7	2.3	169
800	4.21	.35	156	34.16	.06	152	1479.8	1.6	146
900	3.77	.30	129	34.24	.05	128	1479.7	1.4	122
1000	3.41	.27	80	34.31	.04	79	1479.9	1.2	75
1100	3.13	.29	30	34.35	.04	29	1480.4	1.2	28
1200	2.90	.31	15	34.40	.04	15	1481.2	1.4	14
1300	2.70	.27	15	34.44	.03	14	1482.0	1.2	14
1400	2.55	.22	17	34.47	.03	16	1483.1	1.0	16
1500	2.42	.17	22	34.50	.02	21	1484.3	.8	21
1750	2.15	.12	26	34.55	.02	25	1487.4	.6	25
2000	1.97	.06	15	34.57	.04	14	1491.0	.4	14
2500	1.70	.04	14	34.63	.01	14	1498.4	.3	14
3000	1.57	.04	14	34.66	.01	14	1506.5	.3	14
4000	1.49	.02	12	34.68	.01	11	1523.7	.2	11
5000	1.52	.01	9	34.68	.01	8	1541.6	.3	8

Figure L-1. OWS VICTOR - Winter

DEPTH	TEMPERATURE			SALINITY			SOUND VELOCITY		
	MEAN	S.D.	NUM	MEAN	S.D.	NUM	MEAN	S.D.	NUM
0	18.04	1.63	420	34.68	.16	422	1516.1	4.8	420
10	17.85	1.53	421	34.68	.15	422	1515.7	4.6	421
20	17.34	1.37	421	34.69	.13	422	1514.4	4.2	421
30	16.83	1.39	422	34.69	.12	422	1513.0	4.4	422
50	16.00	1.43	422	34.69	.12	422	1510.8	4.7	422
75	15.37	1.49	422	34.67	.12	422	1509.3	5.0	422
100	14.96	1.55	422	34.65	.12	422	1508.3	5.3	422
125	14.62	1.63	422	34.62	.13	421	1507.6	5.6	421
150	14.31	1.70	421	34.60	.13	421	1507.0	5.8	420
200	13.64	1.81	419	34.55	.14	421	1505.5	6.3	418
250	12.81	1.92	415	34.48	.16	420	1503.5	6.9	413
300	11.87	2.01	411	34.41	.17	417	1500.9	7.3	406
400	9.70	2.03	397	34.24	.15	404	1494.6	7.7	390
500	7.46	1.65	397	34.10	.09	401	1487.7	6.5	390
600	5.79	1.03	402	34.06	.06	407	1482.8	4.3	399
700	4.76	.56	400	34.11	.07	404	1480.3	2.6	399
800	4.14	.35	390	34.16	.07	390	1479.5	1.9	388
900	3.71	.27	341	34.25	.06	338	1479.5	1.6	337
1000	3.36	.22	236	34.32	.06	234	1479.7	1.4	233
1100	3.02	.21	86	34.39	.06	84	1480.0	.9	84
1200	2.75	.15	47	34.44	.04	47	1480.6	.7	47
1300	2.60	.14	39	34.47	.04	39	1481.7	.7	39
1400	2.50	.15	30	34.48	.04	30	1483.0	.7	30
1500	2.38	.10	31	34.50	.03	31	1484.2	.6	31
1750	2.12	.07	31	34.56	.02	31	1487.3	.4	31
2000	1.93	.06	24	34.59	.02	24	1490.8	.4	24
2500	1.69	.04	21	34.64	.01	21	1498.3	.0	21
3000	1.56	.03	20	34.65	.02	20	1506.5	.3	20
4000	1.49	.02	18	34.67	.01	18	1523.7	.3	18
5000	1.50	.02	12	34.69	.01	12	1541.6	.3	12

Figure L-2. OWS VICTOR - Spring

DEPTH	TEMPERATURE			SALINITY			SOUND VELOCITY		
	MEAN	S.D.	NUM	MEAN	S.D.	NUM	MEAN	S.D.	NUM
0	24.91	1.45	402	34.43	.17	405	1533.9	3.8	402
10	24.39	1.64	405	34.46	.16	405	1532.8	4.2	405
20	22.89	1.85	405	34.52	.15	405	1529.3	4.9	405
30	21.47	2.17	405	34.59	.15	405	1525.9	5.8	405
50	18.97	2.08	405	34.71	.12	405	1519.5	6.1	405
75	17.29	1.91	405	34.73	.11	405	1515.1	5.9	405
100	16.36	1.80	405	34.71	.11	405	1512.7	5.7	405
125	15.75	1.76	405	34.69	.12	405	1511.2	5.7	405
150	15.26	1.78	405	34.66	.13	405	1510.1	5.9	405
200	14.43	1.89	404	34.61	.14	405	1508.1	6.4	404
250	13.51	2.00	404	34.54	.15	404	1505.9	6.9	403
300	12.49	2.05	404	34.45	.15	402	1503.2	7.3	401
400	10.23	2.05	389	34.27	.16	386	1496.6	7.7	386
500	7.94	1.75	384	34.13	.11	381	1489.6	6.9	381
600	6.10	1.22	392	34.06	.06	389	1484.0	4.9	389
700	4.97	.72	387	34.09	.05	387	1481.1	3.1	385
800	4.26	.43	370	34.16	.06	369	1480.0	2.1	368
900	3.80	.29	328	34.23	.06	329	1479.8	1.7	327
1000	3.46	.22	214	34.30	.05	216	1480.1	1.4	214
1100	3.17	.15	78	34.36	.04	78	1480.6	.8	78
1200	2.94	.15	23	34.40	.03	23	1481.4	.6	23
1300	2.74	.16	17	34.44	.03	17	1482.2	.6	17
1400	2.56	.12	17	34.47	.03	17	1483.2	.5	17
1500	2.41	.11	19	34.50	.03	19	1484.3	.6	19
1750	2.14	.09	29	34.55	.02	29	1487.4	.5	29
2000	1.94	.07	20	34.58	.02	20	1490.8	.4	20
2500	1.69	.04	19	34.63	.02	19	1498.4	.4	19
3000	1.56	.03	19	34.65	.01	19	1506.5	.3	19
4000	1.49	.02	19	34.67	.01	19	1523.7	.3	19
5000	1.51	.01	14	34.68	.01	14	1541.6	.4	14

Figure L-3. OWS VICTOR - Summer

DEPTH	TEMPERATURE			SALINITY			SOUND VELOCITY		
	MEAN	S.D.	NUM	MEAN	S.D.	NUM	MEAN	S.D.	NUM
0	21.41	2.19	302	34.53	.12	304	1525.1	5.8	302
10	21.37	2.18	302	34.53	.12	304	1525.2	5.8	302
20	21.33	2.15	303	34.53	.12	304	1525.2	5.8	303
30	21.21	2.09	303	34.53	.12	304	1525.1	5.6	303
50	20.14	1.84	303	34.57	.11	304	1522.7	5.2	303
75	18.36	2.19	303	34.63	.11	303	1518.1	6.4	302
100	16.93	2.13	304	34.66	.11	303	1514.4	6.5	303
125	15.97	2.01	304	34.66	.12	303	1511.6	6.3	303
150	15.21	1.95	304	34.64	.13	303	1509.9	6.3	303
200	14.08	1.94	304	34.58	.14	303	1507.0	6.5	303
250	13.01	2.02	301	34.50	.15	303	1504.1	6.9	300
300	11.83	2.08	300	34.40	.16	301	1500.7	7.3	297
400	9.22	1.98	283	34.19	.16	287	1492.8	7.4	281
500	7.07	1.58	280	34.08	.09	278	1486.2	6.2	275
600	5.59	1.12	269	34.07	.05	264	1481.9	4.6	263
700	4.63	.69	255	34.12	.06	251	1480.0	3.0	251
800	4.07	.42	236	34.19	.07	234	1479.2	1.9	233
900	3.66	.32	199	34.26	.06	197	1479.2	1.4	195
1000	3.36	.25	120	34.32	.05	119	1479.7	1.2	117
1100	3.21	.26	42	34.35	.05	43	1480.8	1.1	42
1200	3.04	.22	18	34.38	.04	19	1481.8	.9	18
1300	2.80	.17	17	34.43	.03	17	1482.5	.8	17
1400	2.61	.15	17	34.47	.03	17	1483.4	.6	17
1500	2.43	.13	19	34.50	.02	19	1484.4	.6	19
1750	2.15	.09	22	34.55	.02	22	1487.4	.4	22
2000	1.95	.09	11	34.59	.01	11	1490.9	.5	11
2500	1.71	.05	10	34.63	.01	10	1498.4	.4	10
3000	1.58	.02	10	34.65	.01	10	1506.5	.3	10
4000	1.49	.03	9	34.68	.01	9	1523.7	.3	9
5000	1.50	.02	8	34.68	.01	8	1541.6	.3	8

Figure L-4. OWS VICTOR - Autumn

DISTRIBUTION LIST

DATE: June 1977

SERIAL: 3700-67-77

SUBJECT: Variability of Oceanographic Conditions at Ocean Weather Stations in the North Atlantic and North Pacific Oceans

TECHNICAL NOTE 3700-67-77	EVALUATION REPORT
PROGRESS/STATUS REPORT	OTHER
SYSTEMS ANALYSIS REPORT	
LETTER	

CLASSIFICATION:

NUMBER OF COPIES MADE:

COPY NO.	(Internal)	COPY NO.	
1	Code 00	21	
2	Code 01	22	
3	Code 02	23	
4	Code 0111	24	
5	Code 1600	25	
6	Code 3000		
7	Code 3004		
8	Code 3005		
9	Code 3400		
10	Code 3423		
11	Code 3440		
12	Code 3500		
13	Code 3700		
14	Code 3710		
15	Code 3720		
16			
17			
18			
19			
20			

REMARKS: